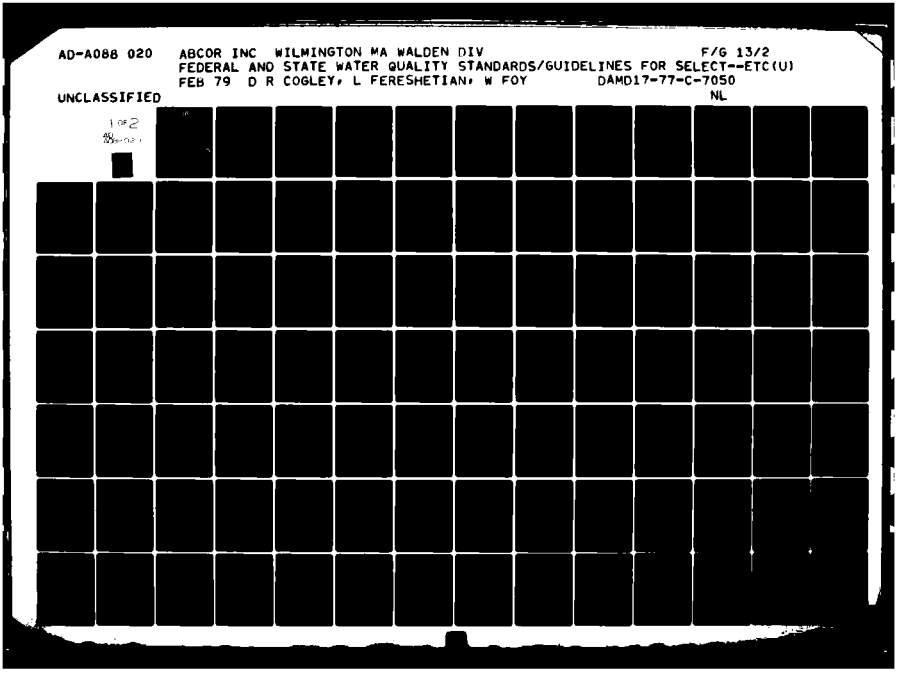
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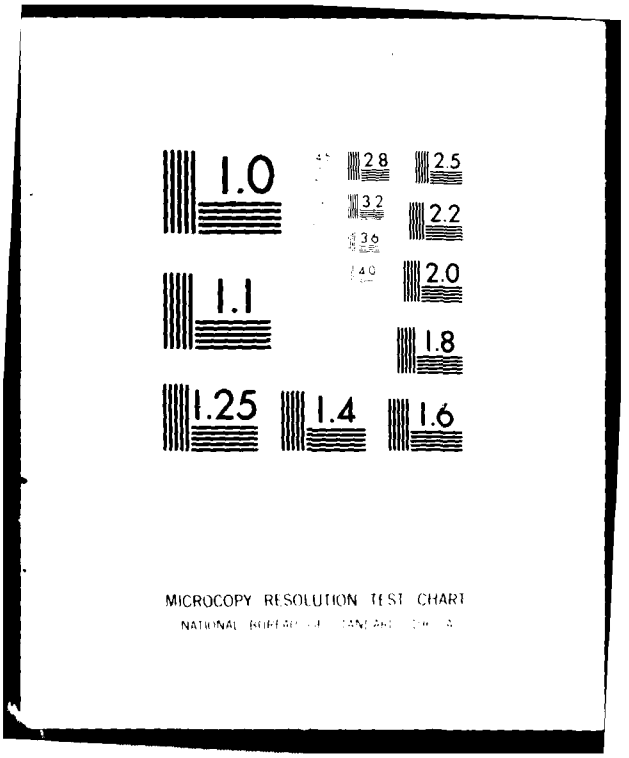
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LEVEL II

AD

FEDERAL AND STATE WATER QUALITY STANDARDS/GUIDELINES FOR SELECTED PARAMETERS

TECHNICAL REPORT

by

David R. Cogley
Linda Fereshetian
Wesley Foy
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FEBRUARY 1979

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US ARMY MEDICAL BIOENGINEERING RESEARCH
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Fort Detrick, Frederick, MD 21701

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Aberdeen Proving Ground, MD 21010

Contract No. DAMD17-77-C-7050

WALDEN DIVISION OF ABCOR, INC.
850 Main Street
Wilmington, MA 01887

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Water quality guidelines
Water quality standards
Wisconsin

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State and Federal guidelines and standards have been compiled for 113 military-relevant water quality parameters for the states of Arkansas, Colorado, Maryland, Missouri, Pennsylvania and Wisconsin.

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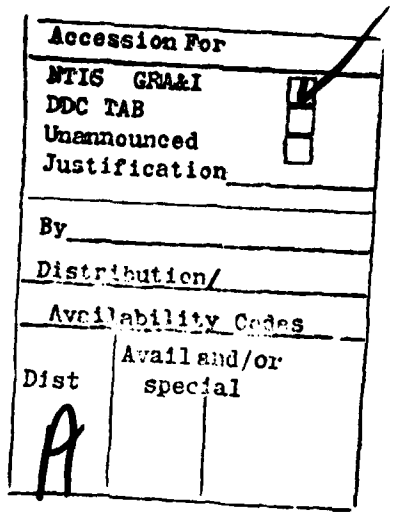
EXECUTIVE SUMMARY

State and Federal guidelines and standards have been compiled for 113 military-relevant water quality parameters for the states of Arkansas, Colorado, Maryland, Missouri, Pennsylvania and Wisconsin. For more than half of these substances, known or suspected to be present in the soil and waters of Army installations, no useful health or environmental guidance can be provided.



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I. INTRODUCTION

A. OBJECTIVES

The United States Army, as proprietor of many major military facilities in the United States, must control wastewater discharges in accordance with Federal, state and local regulations. Walden Division of Abcor, Inc., has studied state regulatory procedures applicable to a total of 113 water parameters in six states. The objectives have been to: (1) characterize state regulatory procedures, demonstrating the range of approaches which have been applied to regulation of wastewater discharges, (2) to cover a range of classical parameters (e.g., BOD) and toxic substances pertinent to Army facilities, and (3) to derive from regulatory literature and personnel a list of typical concentration values (for specific substances) of interest in Army field surveys. In essence we have sought to describe how discharges are regulated, which substances are regulated, and what analytical precision is required to determine whether a facility is in compliance with regulations.

Lists of wastewater parameters for Arkansas, Colorado, Maryland, Missouri, Pennsylvania and Wisconsin were prepared by the Army. A composite list of these substances follows:

SUBSTANCE LIST FOR SIX STATES

Aldrin
Aluminum
Anticholinesterase
Arsenic
Arsenic, total
Barium
Benzaldehyde
Benzanthrone
Biochemical Oxygen Demand
1-(2-Butoxyethoxy) ethanol
Cadmium
Calcium

SUBSTANCE LIST FOR SIX STATES (Cont'd)

Carbonate/Bicarbonate
Chemical Oxygen Demand
Chloride
α-(Chloroacetophenone)
Chloroform
α-(Chloromethyl)-benzyl alcohol
p-Chlorophenyl methyl sulfide
p-Chlorophenyl methyl sulfone
Chromium
Chromium (hexavalent)
Conductivity
Copper
Copper, total
Cyanide
1,2-Cyclohexane oxide
Cyclohexanol
Cyclohexanone
Cyclopentanone
DCPD (Dicyclopentadiene)
o,p'-DDD
p,p'-DDD
o,p'-DDE
p,p'-DDE
o,p'-DDT
p,p'-DDT
DDT, etc.
Dieldrin
Diethyl amine
DIMP (Diisopropyl methylphosphonate)
Dioctyl adipate
Dioctyl azelate
Diphenyl sulfoxide
1,4-Dithiane
DNT (Dinitrotoluene)
DNT (All isomers)
Endrin
Fluoride
Green dye (1,4-di-p-toluidinoanthraquinone)
Hardness, total
Hexachlorobutadiene
Hexachloroethane
Hexachloronorbornadiene
Hydrocarbons (normal, C_{12}-C_{22})

SUBSTANCE LIST FOR SIX STATES (Cont'd)

7-Hydroxybicyclo-(2,2,1)-hepta-2,5-diene
Iron
Isodrin
Lead
Lead ethylhexanoate
Lead salicylate
Lead styphnate
Magnesium
Mercury
Mercury fulminate
Mercury, total
Methylcyclohexane
Methylene chloride
Methyl isopropyl ketone
2-Methyl-2-pentanol
Nemagon
Nitrate/Nitrite
Nitrocellulose
Nitrogen, Kjeldahl
Nitroglycerine
1,4-Oxathiane
PETN (Pentaerythritol tetranitrate)
pH
Phosphate, ortho
Phosphate, total
Phosphonic acids
Phosphorous, red
Phosphorous, white
Polychlorinated ethylenes and ethanes
Potassium
Potassium perchlorate
Radium 226
Radium 228
Red dye (1-Methylaminoanthraquinone)
Silver
Sodium
Sodium styphnate
Strontium nitrate
Strontium oxalate
Strontium peroxide
Sulfate
Tetrachlorobenzene
Tetrachloroethylene
Tetrahydrofuran
Tetrazine

Thiodiglycol
Thiophene
1,4-Thioxane
Thorium (Natural)
Thorium Decay Products
TNT (Trinitrotoluene)
Trichloroethylene
Triethyl phosphate
Trinitroresorcinol
Uranium (Natural)
Uranium Decay Products
Yellow dye (Dibenzo(b,def)chrysene-7,14-dione)
Zinc

B. PROCEDURE

Water pollution control regulations were obtained for each of the six states. These regulations were assessed to determine: responsible state agencies, personnel to be contacted, regulatory procedures, and whenever possible, guidelines or standards for regulated parameters. Federal regulations were similarly assessed.

Letters were prepared and submitted to the appropriate agency in each state requesting information on procedural aspects of the setting of effluent limitations, the number of permits issued for toxic substance discharges, transcripts of proceedings, and legislative changes. Letters were followed-up with telephone calls. The following persons were contacted:

Arkansas

Arkansas Department of Pollution
Control and Ecology
P.O. Box 9583
Little Rock, Arkansas 72209
Attn: Mr. Gerald Southall
Telephone Number: (501) 371-1701

Colorado

Office of the Governor
State Capitol
Denver, Colorado 80203
Attn: James E. Monayhan, Assistant to the Governor
For Natural Resources
Telephone Number: (501) 301-1701

Maryland

Department of Natural Resources
Tawes State Office Building D-2
Annapolis, Maryland 21401
Attn: Ken McElroy, Water Resource Administrator
Telephone Number: (301) 269-3348

Missouri

Department of Natural Resources
P.O. Box 176
Jefferson City, Missouri 65101
Attn: Mrs. Ashford, Director
Telephone Number: (314) 751-4422

Pennsylvania

Department of Environmental Resources
Bureau of Water Quality Management
P.O. Box 2063
Harrisburg, Pennsylvania 17120
Attn: Walter Lyon, Director
Telephone Number: (717) 787-2666

Wisconsin

Department of Natural Resources
P.O. Box 450
Madison, Wisconsin 53701
Attn: Donald Theiler
Telephone Number: (608) 266-8805

C. SUMMARY OF REGULATORY PROCEDURES

1. General

Regulation of wastewater discharges is based on the provisions of the Federal Water Pollution Control Act of 1972 (Public Law 92-500) and, in particular, the procedures prescribed for the issuance of National Pollutant Discharge Elimination System (NPDES) permits. Each state (subject to Federal review) must: (1) classify all surface waters according to type and use, (2) draft regulations to control wastewater discharges to these streams so that water quality is maintained and the prescribed beneficial water uses are realized, and (3) monitor compliance with discharge regulations.

For the six states studied herein, surface water classification systems vary widely. Each state has tailored its classification system to reflect the effects of climate, hydrology, and geology on the possible beneficial uses. Each state has classified its surface waters according to its water use classification system and published these data. For any particular state or location within a state, it is possible to learn the uses which have been mandated for surface waters to which any particular facility might discharge wastewaters.

Wastewater discharges are controlled through the issuance of NPDES permits usually by the state but by the U. S. Environmental Protection Agency if the state has not set up an approved system for the issuance of discharge permits. Regulatory agencies issue NPDES permits on the basis of: (1) an application provided by the would-be discharger, (2) the receiving water classification, (3) guidelines or standards applicable to the water use of the receiving water, and (4) any other scientific evidence concerning the effect of wastewater components on the receiving water use. For some uses such as drinking water

supply, definitive numerical concentration limits have been published in the form of standards for many specific pollutants. For uses such as propagation of native aquatic species, often only guidelines or even only test procedures are specified. In any case, regulatory agency personnel must consider all discharges along each waterway when they set discharge limits, for unless a particular wastewater component will harm the receiving water (prevent a state mandated use) there is no legal basis for preventing its discharge into the receiving water.

A shortcoming of wastewater discharge regulation has been the difficulty of controlling incidental discharges not generally considered to be process related. Regulatory agencies have not had a generally applicable procedure for discovering all of the harmful substances which might be regularly or sporadically discharged to receiving waters. With one exception, states have not, until recently, required producers and handlers of toxic substances to register with them. Michigan has since 1971 required Michigan firms to register with them their uses of substances on the Critical Materials Register (CMR). This allows Michigan to keep track of toxic substances and to prevent discharges to waterways by insisting on appropriate storage, handling, and cleanup procedures. Following the discovery of Kepone pollution of the James River, Virginia adopted Rules and Regulations for the Reporting of Chemical Substances Manufactured or Used in Manufacturing. In addition, the Toxic Substances Control Act provides Federal control of toxic substances.

The Michigan CMR is a definitive list of substances useful to the Army or any other organization seeking information on specific target control levels. As its existence becomes more widely known, it will undoubtedly be used as a reference by those agencies responsible for NPDES permit issuance. The Virginia regulation contains no such list.

The Federal Toxic Substances Control Act, Section 10 Part (g) states "The Administrator shall establish and coordinate a system for exchange among Federal, state, and local authorities of research and development results respecting toxic chemical substances and mixtures, including a system to facilitate and promote the development of standard data format and analysis and consistent testing procedures." It seems likely, therefore, that more and better data will become available from the Federal government for the assessment of toxic effects, which is required in the administration of NPDES permits.

2. Stream Classification Systems for Each State

The diversity of stream classification systems for the six states considered herein results from differences in climate, hydrology, past history of water use, and differing legal approaches. In some cases, water uses are specified in a simple classification system; letter or number designations of these classes are applied to surface waters and corresponding water quality criteria apply directly. In other cases, hydrological or political classification systems are developed but water uses and quality criteria are specified separately in lengthy tables. There is no single stream classification system applicable to all states.

For three states (Arkansas, Colorado, and Maryland), simple use class designations have been developed. Once the particular use designations have been learned for a particular state it is possible to quickly determine the uses to be made of the waters of any particular classified segment.

For the other three states (Missouri, Pennsylvania and Wisconsin), complex use class designations have been developed. Missouri and Pennsylvania surface waters are each individually classified for use

and water quality criteria. Wisconsin has developed the most unique classification system. The political classification matrix, legal basis, and nomenclature are each unique.

a. Arkansas

There are 3 classes for the waters of Arkansas:

- Class AA: Extraordinary recreational and aesthetic value. Suitable for primary contact recreation, propagation of desirable species of fish, wildlife and other aquatic life, raw water source for public water supplies, and other compatible uses.

- Class A: Suitable for primary contact recreation, propagation of desirable species of fish, wildlife, and other aquatic and semi-aquatic life, raw water source for public water supplies, secondary contact recreation, and other uses.

- Class B: Suitable for desirable species of fish, wildlife and other aquatic and semi-aquatic life, raw water source for public water supplies, secondary contact recreation, and other uses.

b. Colorado

There are 4 classes for the waters of Colorado: State waters designated Class A1, A2, B1, or B2 are waters suitable or to become suitable for all purposes for which raw water is customarily used, including primary contact recreation, such as swimming and water skiing.

Water classes A1 and A2 exhibit or are to exhibit the following characteristics: Bacteriological concentrations which do not exceed a geometric mean of 200 fecal coliform groups per 100 milliliters nor 1000 total coliform groups per 100 milliliters based on a minimum of not less than five samples obtained during separate 24-hour periods for any 3-day period, nor do 10 percent of the fecal coliform groups exceed 400 groups per 100 milliliters, nor do 20 percent of the total coliform groups exceed 2000 groups per 100 milliliters based upon an average of five consecutive samples within a 30-day period.

Water in classes B1 and B2 exhibit or are to exhibit the following characteristics: Bacteriological concentrations do not exceed a geometric mean of 10,000 total coliform groups or 1000 fecal coliform groups per 100 milliliters based on a minimum of not less than five samples obtained during separate 24-hour periods for any 30-day period, nor do 10 percent of the fecal coliform samples exceed 2000 groups per 100 milliliters during any 30-day period.

Class A1 is differentiated from A2 on the basis of temperature and dissolved oxygen. The same holds true for B1 and B2.

c. Maryland

All waters of the state shall be protected for use as water contact recreation, for fish, other aquatic life, and wildlife (Class I waters).

Also, the following water classes are given additional protection:

- Shellfish Harvesting (Class II waters)

- Natural Trout Waters (Class III waters)

- Recreational Trout Waters (Class IV waters)

d. Missouri

There are 3 classes for the waters of Missouri:

- Class P - Streams that maintain permanent flow even in drought periods,

- Class P1 - Standing-water reaches of Class P streams, including impoundments,

- Class C - Streams that may cease flow in dry periods, but maintain permanent pools which support aquatic life.

These three classes constitute an initial assessment of the uses to which state waters may be put. Surface waters are further classified in Table J (71 pages) according to water use (nine specified use classes). Water quality standards are specified for combinations of the three water classses and the nine use classes.

e. Pennsylvania

For the purpose of preserving beneficial uses of state waters, Pennsylvania has developed a complex system of use designations (4 use classes and a total of 17 use subclasses) and water quality parameters (23 parameters with many specified values for each parameter) which form the basis of their composite surface water use and water quality criteria classification. Classifications for all state waters

acccording to uses and quality criteria are given in a 63 page listing. Water quality criteria required to meet specified uses have been separately specified for each stream segment. Thus, a knowledge of water use does not lead directly to specific criteria. One must know both the use and the surface water identity in order to learn which criteria apply.

f. Wisconsin

Regulations for preserving beneficial uses of Wisconsin waters are based on the premise that, unless otherwise stated, water quality will be maintained at the highest level thus allowing for any and all uses. Variances are then specified whenever only limited uses are allowed. The system description (Chapters NR 102, 103, and 104 of the Wisconsin Regulation) is cumbersome.

Chapter NR 102 describes three use categories: (1) fish and aquatic life (warm water and trout fisheries), (2) recreational use, and (3) public water supply.

Chapter NR 103 describes uses and designated standards for interstate waters. For each water body, uses are listed, e.g.,, wildlife and stock watering, waste assimilation, warm water fishery, recreation, industrial supply, irrigation. In addition, water quality standards are specified in the following type of narrative format: "Water quality in the _____ River shall meet the standards for recreational use and fish and aquatic life." Variances from the water quality standards (of NR 102) are specified on a stream-by-stream basis.

Chapter NR 104 describes uses and designated standards for intrastate waters. Data are presented in a tabular format with five columns listing: surface water identification, reach description,

hydrologic class (6 possible classifications), applicable criteria, and effluent limitations. Only water bodies requiring variances from the highest use class are listed. There are two water use variances: (1) surface waters not supporting a balanced aquatic community (intermediate aquatic life), and (2) marginal surface waters. Quality criteria (applicable to the receiving water) are specified for these two variance classes. Effluent criteria (applicable to effluent discharges) are also specified. Finally, a general clause is added to allow for case-by-case assessments of virtually any receiving water or discharge.

3. Legislative Abstracts

Regulations for each state were examined to determine how each state regulates toxic substance discharges. Of particular interest was the extent to which particular toxic compounds were cited in the regulations. The applicable regulation sections are cited below:

a. Arkansas

Toxic materials attributable to municipal, industrial, agricultural, or other waste discharges shall not be present in receiving waters in such quantities as to be toxic to human, animal, plant or aquatic life or to interfere with the normal propagation of aquatic life. For any toxicants, concentrations in the receiving waters after mixing shall not exceed 0.01 of the ninety-six (96) hour median tolerance level (TLm), unless they can be shown to be non-persistent and non-cumulative, and to exhibit no synergistic interactions with other waste or stream components. In no case shall concentrations exceed 0.05 of the 96 hour TLm.

b. Colorado

All state waters shall be free from substances attributable to municipal, industrial, or other discharges or agricultural practices in concentrations or combinations which are toxic and harmful to human, animal, plant, or aquatic life.

c. Maryland

The waters of the state shall at all times be free from any liquid, gaseous, or solid substance or substances in such concentrations which, when applied to, discharged to, or deposited in the waters of the state, may exert a poisonous effect detrimental to man or to the propagation, cultivation, or conservation of animals, fish or other aquatic life.

d. Missouri

The waters of the state shall be free of persistent, bioaccumulative, man-made toxic substances. These substances include, but are not limited to: PCBs, DDT, endrin, aldrin, dieldrin, heptachlor, methoxychlor, mirex, toxaphene, lindane, chlordane, and benzidine. Other potentially toxic substances for which sufficient toxicity data are not available may not be released to waters of the state until safe levels are demonstrated through adequate bioassay studies. All streams and lakes shall conform with state and Federal limits for radionuclides established for drinking water supply.

e. Pennsylvania

Water shall not contain substances attributable to municipal, industrial, or other waste discharges in concentrations or

amounts sufficient to be inimical or harmful to the water uses to be protected or to human, animal, plant or aquatic life.

f. Wisconsin

Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life.

4. Letter and Telephone Survey

The unique and detailed stream classifications and water quality standards could be taken to indicate that most of the states were engaged in wide-ranging programs to control wastewater discharges. The uniqueness of these systems portended a requirement for detailed information from toxic substances discharges. If each state required different data, the Army might be called upon to submit it. For this reason, a limited letter and telephone survey of the appropriate state agencies was conducted. Agencies were asked: (1) Is the state or the U.S. Environmental Protection Agency responsible for NPDES permit issuance? (2) What are the procedures for setting effluent limitations for toxic substances? (3) How many permits for toxic substance discharges have been issued? (4) Are transcripts available which illustrate how toxic substances effluent limitations are derived? In each case, we provided citations of state legislation and asked if these mandated procedures were followed.

Responses to our survey were brief. We did not discover, in any of the six states, a large scale, organized approach to regulation of toxic substances other than pesticides. No hearing transcripts

were available from any of the states. We present below the essence of the responses for each state.

In Arkansas, NPDES permits are issued by the U. S. Environmental Protection Agency. Regarding the setting of effluent limitations we learned only that the burden of proof lies with the discharger.

Colorado NPDES permits are issued by the state. No other information was received.

In Maryland NPDES permits are issued by the state. Limits are based on EPA guidance documents or promulgated guidelines, water quality considerations, toxicity considerations, estimations of best engineering judgment, and any other considerations available. In excess of 1000 state and NPDES discharge permits have been issued.

Missouri NPDES permits are issued by the state. No effluent limitations have been set for toxic substances that are not specifically set in 10 CSR 20-7.020 of the Missouri Water Pollution Control Regulations, or the EPA guidelines.

In Pennsylvania, NPDES permits are issued by the state. There is no readily available information as to the number of cases that may have involved the setting of effluent limitations for toxic substances. One reason for this is the lack of reporting of these kinds of substances and the lack of information available to evaluate their effects.

Wisconsin NPDES permits are issued by the state. Section 144.54(2) of the Wisconsin Water Pollution Control Law does not provide for the setting of pollutant standards. Section 147.02(1) is enabling legislation that would allow the department to incorporate Federal

standards into state administrative rules. The state has issued between 150-200 permits that contain effluent limitations for toxic materials. For the most part, toxic substances limitations are for specific heavy metals, ammonia, or residual chlorine. Wisconsin uses the $Q_{7,10}$ flow of receiving water, the concentration of toxic materials in the discharge, and the flow of the discharge in a simple mass balance to derive effluent limitations.

5. Michigan Critical Materials Register

Michigan, unlike the six states previously discussed, has elected to provide additional control of toxic substances by requiring all industries with water discharges to file annual reports indicating: (1) the nature of their enterprise, (2) the quantities of materials used, and (3) the quantities of materials discharged which appear on the Critical Materials Register (CMR).

Mr. Richard Powers, of the Michigan Critical Materials Register (telephone (517) 373-6794), indicates that Michigan is updating and refining; procedures for inclusion of compounds in the CMR and procedures for preventing spills of compounds listed in the CMR. The key feature of the CMR is seen to be flexibility. The goal of their CMR effort is to identify potential environmental crises and to prevent serious environmental damage.

Four hundred ten chemicals have been screened and 181 of these now appear in the CMR: 64 pesticides, 93 other organics, and 24 inorganics. The screening procedure currently in use is indicated in Figure 1, and the hazard assessment sheet in Figure 2. Protocols for specification of numerical ratings have been prepared for: acute toxicity (oral LD_{50}, dermal LD_{50}, and aquatic 96 hr LC_{50}), carcinogens,

Common Chemical Name _____ Chemical Abstract No. _____

Chemical Abstract Name _____

I. ACUTE TOXICITY — SCORE _____

SCORE	ORAL LD_{50} mg/kg	DERMAL LD_{50} mg/kg	AQUATIC 96 HOUR LC_{50} mg/l
7	< 5	< 5	< 1
3	5-50	5-200	1-10
2	>50-500	> 200-500	> 10-100
1	>500-5000	> 500-5000	> 100-1000
0	> 5000	> 5000	>-1000
*	Insufficient information		

II CARCINOGENICITY _____

SCORE	CATEGORY
7	Human positive *human suspect* Animal positive
3	Animal suspect
2	Carcinogenic by a route other than oral or dermal
2	Strongly suspect carcinogen by accepted mutagenicity screening tests
1	Suspect carcinogen by accepted mutagenicity screening tests
0	Not carcinogenic
*	Insufficient information

III. HEREDITARY MUTAGENICITY _____

SCORE	CATEGORY
7	Confirmed
3	Suspect
0	Not teratogenic
*	Insufficient information

IV. TERATOGENICITY

SCORE	CATEGORY
7	Confirmed
3	Suspect
0	Not teratogenic
*	Insufficient information

V. PERSISTENCE _____

SCORE	CATEGORY
4	Very persistent
3	Persistent
2	Slowly degradable
1	Moderately degradable
0	Readily degradable
*	Insufficient information

VI BIOACCUMULATION _____

SCORE	BIOACCUMULATION	LOG P
7	> 4000	> 6.00
3	1000 - 3999	5.00 - 5.99
2	700 - 999	4.50 - 4.99
1	300 - 699	4.00 - 4.49
0	< 300	< 4.00
*	*Insufficient information*	

VII AESTHETICS _____

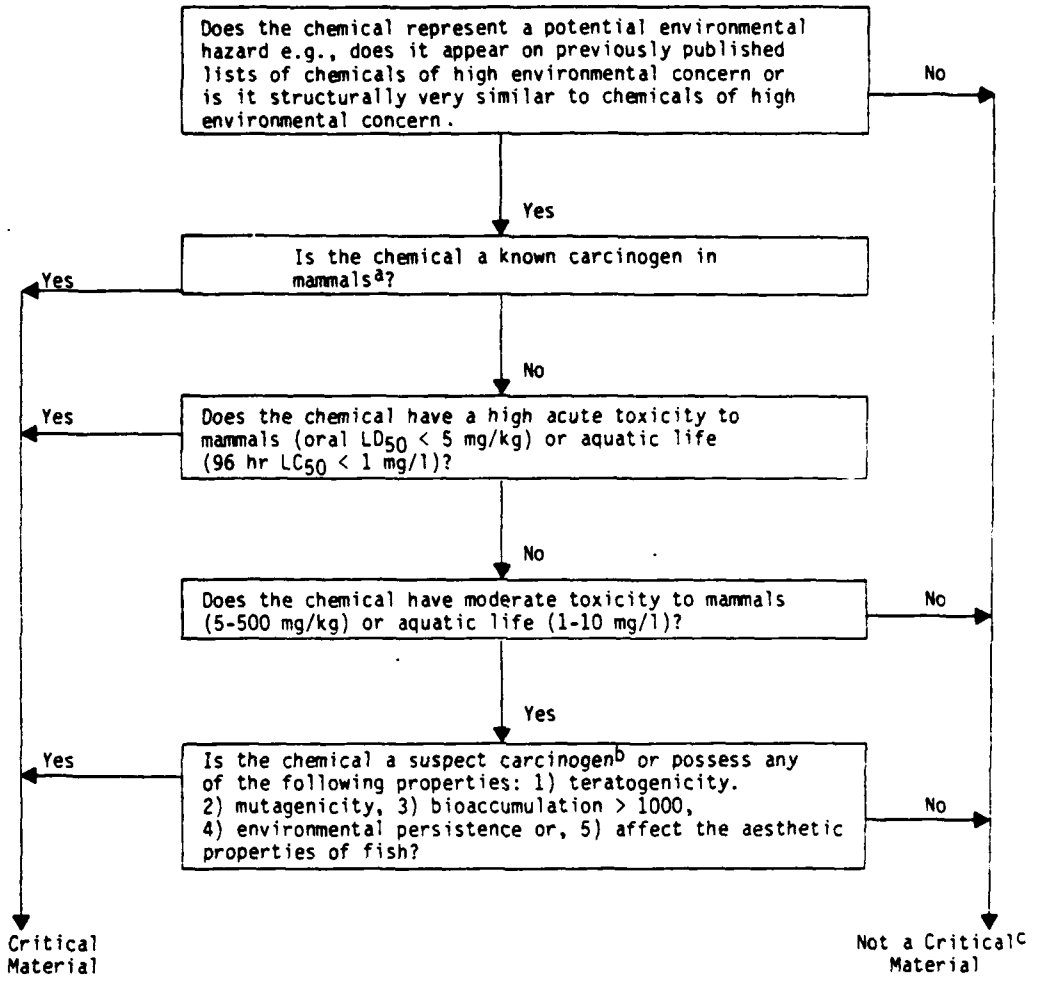
SCORE	Fish Tainting and/or Taste & Odor Est. threshold level in water mg/l	Foaming, floating film, and/or major color change
3	0.001-0.001	
2	> 0.001-0.01	
1	> 0.01 - 0.1	Yes
0	> 0.1	No
*	Insufficient information	

VIII. CHRONIC ADVERSE EFFECTS _____

SCORE	CATEGORY
4	Irreversible effects
2	Reversible effects
1	Adverse effects by route other than oral, dermal or aquatic
0	No detectable adverse effects
*	Insufficient information

TOTAL SCORE (≥ 7 needed for 78 CMR) _____

FIGURE 2. CRITICAL MATERIALS REGISTER HAZARD ASSESSMENT SHEET



a. A known carcinogen is defined as a chemical meeting one of the following criteria: 1) appears on the NIOSH carcinogen list, 2) has been demonstrated through epidemiological studies to be a human carcinogen, 3) has been shown at low doses (1% of LD_{50}) to increase tumor production by oral administration in at least two species of animals.

b. A suspect carcinogen is defined as a chemical meeting the following criteria; has been shown to increase tumor production only at high doses (> 1% of LD_{50}) or by a route other than oral or in only one species.

c. A chemical not meeting these criteria may still be designated a critical material if the CMR advisory committee determines the compound represents an unreasonable environmental risk due to other factors.

FIGURE 1. MICHIGAN MODEL FOR SCREENING AND SELECTING CRITICAL MATERIALS.

hereditary mutagens, teratogens, persistence, bioaccumulation, aesthetics, and chronic toxicity.

The CMR seems to be the most advanced state system for minimizing the ecological effects of toxic substances. The numerical rating protocol which they have adopted might well serve as a system with which the Army could prioritize toxicology research related to NPDES permits in the states with Army facilities.

Nineteen of the 114 CMR substances are Army designated parameters considered in the present report: aldrin, arsenic, cadmium, chromium, chromium (hexavalent), copper, cyanide, o,p'-DDD, p,p'-DDD, o,p'-DDE, p,p'-DDE, o,p'-DDT, p,p'-DDT, dieldrin, endrin, hexachlorobutadiene, mercury, white phosphorous, and zinc.

6. Toxic Substance Act

The Toxic Substances Act (15 USC 2601, et seq., PL 94-469; Oct 12, 1976) will lead to a Federal data base on toxic substances which may be of future use to the Army. It is too early however to estimate when or if the data base will contain sufficient information for all Army compounds of interest.

D. SUMMARY OF REPORT ORGANIZATION

In Section II, primary data are presented in tabular form for each individual state and also in a comprehensive list.

In Section III, substances for which numerical limits have been obtained, (from references listed in Section IV), are listed in Table 8. Those substances whose values are not at the present time specified in documents issued by, or generally used by, Federal or state regulatory agencies, are tabulated in Table 9.

II. GUIDELINES, STANDARDS AND EFFLUENT LIMITATIONS

Guidelines, standards, and effluent limitations are presented for parameters as requested for each state (Tables 1-6) and in a comprehensive list (Table 7). Data are presented in a fixed tabular format for ease in reading. Compounds are listed alphabetically.

A. ARKANSAS

Information is presented (Table 1) for 34 parameters; BOD, COD, hardness, pH, 20 inorganic materials, 6 DDT-related compounds, and 4 dyes. An alphabetical listing of these parameters is included.

Arsenic
Barium
Benzanthrone
Biochemical Oxygen Demand
Cadmium
Calcium
Carbonate/Bicarbonate
Chemical Oxygen Demand
Chloride
Chromium (hexavalent)
Copper
o,p'-DDD
p,p'-DDD
o,p'-DDE
p,p'-DDE
o,p'-DDT
p,p'-DDT
Green dye (1,4-di-p-toluidinoanthraquinone)
Hardness, total
Lead
Magnesium
Mercury
Nitrate/Nitrite
Nitrogen, Kjeldahl
pH
Phosphate, ortho
Phosphate, total
Phosphorous, white
Potassium
Red dye (1-methylaminoanthraquinone)

Sodium
Sulfate
Yellow dye (Dibenzo(b,def)chrysene-7,14-dione)
Zinc

The following description of potentially toxic substances and pH requirements of Arkansas waters is derived from the Arkansas Regulation Establishing Water Quality Standards for Surface Waters[3].

- Toxic Substances - Toxic materials attributable to municipal, industrial, agricultural, or other waste discharges, shall not be present in receiving waters in such quantities as to be toxic to human, animal, plant or aquatic life or to interfere with the normal propagation of aquatic life. For any toxicants, concentrations in the receiving waters after mixing shall not exceed 0.01 of the ninety-six (96) hour Median Tolerance Limit (TLm), unless they can be shown to be nonpersistent and noncumulative, and to exhibit no synergistic interactions with other waste or stream components. In no case shall concentrations exceed 0.05 of the 96-hour TLm.

- pH - The pH of water in the stream or lake must not fluctuate in excess of 1.0 pH unit, within the range of 6.0 to 9.0, over a period of 24 hours. The pH shall not be below 6.0 or above 9.0 due to wastes discharged to the receiving waters.

Concentration values of interest in field surveys are summarized in Section III with a list of compounds for which recommendations cannot be given.

Should further information be required, the following departments/ people can be contacted.

- Arkansas Department of Pollution Center and Ecology
  Mr. Bobby Voss, Director
  8001 National Drive
  Little Rock, Arkansas 72209
  Telephone: (501) 371-1701

  Function: Agency in charge of Water Pollution Control Regulations.

- Bob Blaney, Water Permits Coordinator
  8001 National Drive
  Little Rock, Arkansas 72209
  Telephone: (501) 371-1701

  Function: Deals specifically with the permits and support branch of the EPA.

- Bill Black and
  Ken Kirkpatrick, Overseer of Water Quality
  U.S. EPA
  Washington, DC 10460
  Telephone: (214) 749-1947

  Function: Deal with Arkansas State Water Control.

TABLE 1

ARKANSAS GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Arsenic	Barium	Benzanthrone
FEDERAL GUIDELINES (1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	0.05 mg/l - See comment.	1 mg/l	See comment.
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS(2)	0.05 mg/l	1 mg/l	--
ARKANSAS STANDARDS(3)	(4)	(4)	(4)
NPDES Permit #AR 0001678	--	5.0 kg/day	--
COMMENTS:	Criteria for arsenic in the irrigation of crops is 0.10 mg/l.		USSR reservoir guideline is 0.05 mg/kg, as cited in Loshakov, "Hygienic Basis for the Permissible Concentration of Benzanthrone in Reservoir Water, "Vop. Kommunal, gig.6, 33-36 (1966).

*Not applicable

TABLE 1, Cont'd ARKANSAS GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Biochemical Oxygen Demand	Cadmium	Calcium
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	0.01 mg/l	--
Freshwater Aquatic Life and Wildlife	--	0.0004 mg/l in soft water. See comment. 0.0012 mg/l in hard water. See comment.	--
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS [2]	--	0.01 mg/l	--
ARKANSAS STANDARDS[3]	(4)	(4)	(4)
NPDES Permit #AR 0001678	37.5 kg/day	--	--
COMMENTS:	.	For cladocerans and salmonid fishes. For other, less sensitive, aquatic life, the concentration is an order of magnitude greater.	

*Not applicable

TABLE 1, Cont'd ARKANSAS GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Carbonate/Bicarbonate	Chemical Oxygen Demand	Chloride
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	--	250 mg/l - See comment.
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS [2]	--	--	--
ARKANSAS STANDARDS[3]	(4)	--	250 mg/l
NPDES Permit #AR 0001678	--	--	--
COMMENTS:			Water Quality Criteria - Report of the National Technical Advisory Committee to the Secretary of the Interior, April 1, 1968, Wash., DC, Federal Water Pollution Control Administration.

*Not applicable

TABLE 1, Cont'd ARKANSAS GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Chromium (hexavalent) See comment 1.	Copper	o,p' -DDD
FEDERAL GUIDELINES(1).			
Recreation and Aesthetic Uses	--	--	0.05 mg/l total for all DDT isomers and metabolites. See comment 1.
Public Water Supplies	0.05 mg/l - See comment 2.	1 mg/l	--
Freshwater Aquatic Life and Wildlife	See comments 2 and 3.	0.1 x 96 hr LC_{50}	0.000002 mg/l total for all DDT isomers and metabolites. See comment 2.
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS(2)	--	--	--
ARKANSAS STANDARDS(3)	(4)	(4)	(4)
NPDES Permit #AR 0001678	--	--	--
COMMENTS:	1. See chromium, page 113. 2. Water Quality Criteria - Report of the National Technical Advisory Committee to the Secretary of the Interior, April 1, 1968, Wash., DC, Federal Water Pollution Control Administration. 3. Concentrations of 0.02 mg/l in soft water have been found safe for salmonid fishes.		1. The persistence, bioaccumulation potentials, and carcinogenicity of DDT caution human exposure to a minimum. 2. It is recommended that in a homogeneous sample of 25 or more fish of representative size consumed by birds and mammals, the concentrations of DDT and derivatives (DDD and DDE) be not more than 0.050 mg/kg of wet wgt.

*Not applicable.

TABLE 1, Cont'd ARKANSAS GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	p,p' -DDD	o,p' -DDE	p,p' -DDE
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	0.05 mg/l for all DDT isomers and metabolites. See comment 1.	0.05 mg/l total for all DDT isomers and metabolites. See comment 1.	0.05 mg/l total for all DDT isomers and metabolites. See comment 1.
Freshwater Aquatic Life and Wildlife	0.000002 mg/l total for all DDT isomers and metabolites. See comment 2.	0.000002 mg/l total for all DDT isomers and metabolites. See comment 2.	0.000002 mg/l total for all DDT isomers and metabolites. See comment 2.
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS(2)	--	--	--
ARKANSAS STANDARDS(3)	(4)	(4)	(4)
NPDES Permit #AR 0001678	--	--	--
COMMENTS:	1. The persistence, bioaccumulation potentials, and carcinogenicity of DDT caution human exposure to a minimum. 2. It is recommended that in a homogeneous sample of 25 or more fish of representative size consumed by birds and mammals, the concentrations of DDT and derivatives (DDD and DDE) be not more than 0.05 mg/kg of wet wgt.	1. The persistence, bioaccumulation potentials, and carcinogenicity of DDT caution human exposure to a minimum. 2. It is recommended that in a homogeneous sample of 25 or more fish of representative size consumed by birds and mammals, the concentrations of DDT and derivatives (DDD and DDE) be not more than 0.05 mg/kg of wet wgt.	1. The persistence, bioaccumulation potentials, and carcinogenicity of DDT caution human exposure to a minimum. 2. It is recommended that in a homogeneous sample of 25 or more fish of representative size consumed by birds and mammals, the concentrations of DDT and derivatives (DDD and DDE) be not more than 0.05 mg/kg of wet wgt.

*Not applicable

TABLE 1, Cont'd ARKANSAS GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	o,p' -DDT	p,p' -DDT	Green Dye (1,4-di-p-toluidinoanthraquinone)
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	0.05 mg/l total for all DDT isomers and metabolites. See comment 1.	0.05 mg/l total for all DDT isomers and metabolites. See comment 1.	--
Freshwater Aquatic Life and Wildlife	0.000002 mg/l total for all DDT isomers and metabolites. See comment 2.	0.000002 mg/l total for all DDT isomers and metabolites. See comment 2.	--
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS[2]	--	--	--
ARKANSAS STANDARDS[3]	(4)	(4)	(4)
NPDES Permit #AR 0001678	--	--	--
COMMENTS:	1. The persistence, bioaccumulation potentials, and carcinogenicity of DDT caution human exposure to a minimum. 2. It is recommended that in a homogeneous sample of 25 or more fish of representative size consumed by birds and mammals, the concentrations of DDT and derivatives (DDD and DDE) be not more than 0.05 mg/kg of wet wgt.	1. The persistence, bioaccumulation potentials, and carcinogenicity of DDT caution human exposure to a minimum. 2. It is recommended that in a homogeneous sample of 25 or more fish of representative size consumed by birds and mammals, the concentrations of DDT and derivatives (DDD and DDE) be not more than 0.05 mg/kg of wet wgt.	

*Not applicable.

TABLE 1, Cont'd ARKANSAS GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Hardness, total	Lead	Magnesium
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	Dependent on consumer preference.	0.05 mg/l	--
Freshwater Aquatic Life and Wildlife	--	0.01 x 96 hr LC_{50}. See comment.	--
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS (2)	--	0.05 mg/l	--
ARKANSAS STANDARDS(3)	--	(4)	(4)
NPDES Permit #AR 0001678	--	0.2 kg/day	--
COMMENTS:		...using the receiving or comparable water as the dilutent and soluble lead measurements (using an 0.45 micron filter), for sensitive resident species.	

*Not applicable

TABLE 1, Cont'd ARKANSAS GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Mercury	Nitrate/Nitrite	Nitrogen, Kjeldahl
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	Case-by case study.	--
Public Water Supplies	0.002 mg/l	10 mg/l / 1 mg/l	--
Freshwater Aquatic Life and Wildlife	0.00005 mg/l. See comment	--	--
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS(2)	0.002 mg/l	10 mg/l NO_3-N	--
ARKANSAS STANDARDS(3)	(4)	(4)	(4)
NPDES Permit #AR 0001678	--	--	--
COMMENTS:	Less than a total body burden of 0.0005 mg/g wet wt. in any aquatic organism; total mercury in unfiltered water less than or equal to 0.0002 mg/l at any time; and average total concentration in unfiltered water less than or equal to 0.00005 mg/l. 0.0005 mg/g of fish will protect fish eating birds.		

*Not applicable

TABLE 1, Cont'd ARKANSAS GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	pH	Phosphate, ortho	Phosphate, total
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	6.5 - 8.3	--	--
Public Water Supplies	5.0 - 9.0	See comment.	See comment 1.
Freshwater Aquatic Life and Wildlife	6.5 - 9.0. See comment.	See comment.	See comment 2.
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS[2]	6.0 - 9.0	--	--
ARKANSAS STANDARDS[3]	6.0 - 9.0. No fluctuation greater than 1.0 pH unit per 24 hours.	--	0.100 mg/l in streams. 0.050 mg/l in lakes and reservoirs
NPDES Permit #AR 0001678	--	--	5.0 kg/day
COMMENTS:	Maximum level of protection 6.5-8.5, no variation greater than 0.5 pH units. High level of protection 6.0-9.0, no variation greater than 0.5 pH units. Moderate level of protection 6.0-9.0, no variation greater than 1.0 pH units. Low level of protection 5.5-9.5, no variation greater than 1.5 pH units.	Due to the complexity of relationships of phosphate concentration in water, biological productivity, and resulting problems such as odor and filtration difficulties, no recommendation is given.	1. Due to the complexity of relationships of phosphate concentration in water, biological productivity, and resulting problems such as odor and filtration difficulties, no recommendation is given. 2. 0.05 mg/l in any stream at point where it enters any lake or reservoir, or 0.025 mg/l within the lake or reservoir. 0.100 mg/l in streams or other flowing waters not discharging into impoundments.

*Not applicable

TABLE 1, Cont'd ARKANSAS GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Phosphorus, white	Potassium	Red Dye (1-methylaminoanthraquinone)
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	--	--
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS[2]	--	--	--
ARKANSAS STANDARDS[3]	(4)	(4)	(4)
NPDES Permit #AR 0001678	--	--	--

COMMENTS:

*Not applicable

TABLE 1, Cont'd ARKANSAS GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Sodium See comment.	Sulfate	Yellow Dye (Dibenzo(b,def)chrysene-7,14-dione)
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	No limit recommended due to differences in human sodium tolerance.	250 mg/l	--
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	*	--	*
FEDERAL STANDARDS[2]	--	--	--
ARKANSAS STANDARDS[3]	--	--	(4)
NPDES Permit #AR 0001678	--	--	--
COMMENTS:	Sodium in ionic form.		

*Not applicable

TABLE 1, Cont'd ARKANSAS GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Zinc
FEDERAL GUIDELINES(1)	
Recreation and Aesthetic Uses	--
Public Water Supplies	5 mg/l
Freshwater Aquatic Life and Wildlife	0.1 x 96 hr LC_{50}
Marine Aquatic Life and Wildlife	*
FEDERAL STANDARDS(2)	--
ARKANSAS STANDARDS(3)	(4)
NPDES Permit #AR 0001678	1.2 kg/day
COMMENTS:	

*Not applicable

B. COLORADO

Information is presented (Table 2) for 39 parameters; conductivity, hardness, nitrate/nitrite, pH, 9 inorganic ions or compounds, 5 pesticides and 20 other organic compounds. The parameters, in alphabetical order are:

Aldrin
Arsenic, total
Cadmium
Calcium
Chloride
Chloroform
p-Chlorophenyl methyl sulfide
p-Chlorophenyl methyl sulfone
Conductivity
Copper, total
DCPD (Dicyclopentadiene)
DDT, etc.
Dieldrin
DIMP (Diisopropyl methylphosphonate)
Dioctyl adipate
Dioctyl azelate
1,4-Dithiane
Endrin
Fluoride
Hardness, total
Hexachlorobutadiene
Hexachloronorbornadiene
7-Hdyroxybicyclo-(2,2,1)-hepta-2,5-diene
Isodrin
Mercury, total
Methylene chloride
2-Methyl-2-pentanol
Nemagon
Nitrate/Nitrite
1,4-Oxathiane
pH
Potassium
Sodium
Sulfate
Tetrachlorobenzene
Tetrachloroethylene
1,4-Thioxane (Synonym for 1,4-Oxathiane)
Trichloroethylene
Triethyl phosphate

The following recommendation for potentially toxic substances and the guidelines for pH in Colorado waters is derived from the Colorado Water Quality Control Commission Water Quality Standards[5].

- Toxic Substances - All Colorado waters must be free from toxic materials. A toxic material is defined as any material which is harmful to human, plant, animal, and aquatic life.

- pH - Water in the class specified exhibits or is to exhibit the following pH characteristic:

  Classes A_1 and A_2: A pH rating of not more than 8.5 nor less than 6.5 units.

  Classes B_1 and B_2: A pH rating of not more than 9.0 nor less than 6.0 units.

Concentration values of interest in field surveys are summarized in Section III together with a list of compounds for which recommendations cannot be given.

Should further information be required, the following departments/people can be contacted.

- Department of Health/Water Quality Division
  Mr. Flynn
  4210 E. 11th Street
  Denver, Colorado
  Telephone: (303) 388-611, Ext. 231

  Function: Agency in charge of Water Pollution Control Regulations

- Allen Merson, Regional Director of Region VIII of USEPA
  see above address
  Telephone: (303) 837-3895

  Function: Concerned with policy making.

- Charles Murray, Director of Colorado Water Quality Div.
  see above address
  Telephone: (303) 837-4871

  Function: Deals with USEPA in Washington, DC.

TABLE 2

COLORADO GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Aldrin	Arsenic, total	Cadmium
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	0.001 mg/l	0.05 mg/l. See comment 1.	0.01 mg/l
Freshwater Aquatic Life and Wildlife	0.000003 mg/l[6]	--	0.0004 mg/l in soft water. See comment 1. 0.0012 mg/l in hard water. See comment 1.
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS[2]	--	0.05 mg/l	0.01 mg/l
COLORADO STANDARDS[5]	See comment.	See comment 2.	See comment 2.
NPDES Permit #CO 0021202	--	--	--
COMMENTS:	Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Sub-Section (1)d."	1. Criteria for arsenic in the irrigation of crops is 0.10 mg/l. 2. Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Sub-section (1)d."	1. For cladocerans and salmonid fishes. For other, less sensitive, aquatic life, the concentration is an order of magnitude greater. 2. Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."

*Not applicable

TABLE 2, Cont'd COLORADO GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Calcium	Chloride	Chloroform
FEDERAL GUIDELINES(1)			See comment 1.
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	250 mg/l. See comment 1.	--
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS(2)	--	--	--
COLORADO STANDARDS(5)	See comment.	See comment 2.	See comment 2.
NPDES Permit #CO 0021202	--	--	--
COMMENTS:	Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	1. Water Quality Criteria - Report of the National Technical Advisory Committee to the Secretary of the Interior, April 1, 1968, Wash, DC, Federal Water Pollution Control Administration. 2. Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	1. Human exposure should be minimized. 2. Colorado Water Quality Standard state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."

*Not applicable

TABLE 2, Cont'd COLORADO GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	p-Chlorophenyl methyl sulfide	p-Chlorophenyl methyl sulfone	Conductivity
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	--	--
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS(2)	--	--	--
COLORADO STANDARDS(5)	See comment.	See comment.	--
NPDES Permit #CO 0021202	--	--	--
COMMENTS:	Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	

*Not applicable

TABLE 2, Cont'd COLORADO GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Copper, total	DCPD (Dicyclopentadiene)	DDT,etc.
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	1 mg/l	--	0.05 mg/l total for all DDT isomers and metabolites. See comment 1.
Freshwater Aquatic Life and Wildlife	0.1 x 96 hr LC_{50}	--	0.000002 mg/l total for all DDT isomers and metabolites. See comment 2.
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS(2)	--	--	--
COLORADO STANDARDS(5)	See comment.	See comment.	See comment 3.
NPDES Permit #CO 0021202	--	--	--
COMMENTS:	Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standard Applicable to All State Waters, Subsection (1)d."	1. The persistence, bioaccumulation potential, and carcinogenicity of DDT caution human exposure to a minimum. 2. It is recommended that in a homogeneous sample of 25 or more fish of representative size consumed by birds and mammals, the concentrations of DDT and derivatives (DDD and DDE) be not more than 0.05 mg/kg of wet wgt. 3. Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."

*Not applicable

TABLE 2, Cont'd COLORADO GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Dieldrin	DIMP (Diisopropyl methylphosphonate)	Dioctyl adipate
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	0.001 mg/l	--	--
Freshwater Aquatic Life and Wildlife	0.000003 mg/l(6)	--	--
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS(2)	--	--	--
COLORADO STANDARDS(5)	See comment.	See comment.	See comment.
NPDES Permit #CO 0021202	--	--	--
COMMENTS:	Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."

*Not applicable

TABLE 2, Cont'd COLORADO GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Dioctyl azelate	1,4-Dithiane	Endrin
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	--	0.002 mg/l
Freshwater Aquatic Life and Wildlife	--	--	0.000004 mg/l
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS (2)	--	--	--
COLORADO STANDARDS(5)	See comment.	See comment.	See comment.
NPDES Permit #CO 0021202	--	--	--
COMMENTS:	Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."

*Not applicable

TABLE 2, Cont'd COLORADO GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Fluoride	Hardness, total	Hexachlorobutadiene
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	Recommended concentration dependent on temperature. See comment 1.	Dependent on consumer preference.	--
Freshwate, Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS(2)	Recommended concentration dependent on temperature. See comment 2.	--	--
COLORADO STANDARDS(5)	See comment 2.	--	See comment.
NPDES Permit #CO 0021202	--	--	--
COMMENTS:	1. Annual Ave. of Max. Daily Air Temp., ^{o}F, (fluoride max, mg/l); 80-91,(1.4); 72-79,(1.6); 65-71,(1.8); 59-54,(2.0); 55-58,(2.2); 50-54,(2.4). 2. Colorado Water Quality Standards state that "All state waters shall be: free from substances..which are toxic and harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."		Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."

*Not applicable

TABLE 2, Cont'd COLORADO GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Hexachloronorbornadiene	7-Hydroxybicyclo-(2,2,1)-hepta-2,5-diene	Isodrin
FEDERAL GUIDELINES (1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	--	--
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS(2)	--	--	--
COLORADO STANDARDS(5)	See comment.	See comment.	See comment.
NPDES Permit #CO 0021202	--	--	--
COMMENTS:	Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."

*Not applicable

TABLE 2, Cont'd COLORADO GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Mercury, total	Methylene chloride	2-Methyl-2-pentanol
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	0.002 mg/l	--	--
Freshwater Aquatic Life and Wildlife	0.00005 mg/l. See comment 1.	--	--
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS(2)	0.002 mg/l	--	--
COLORADO STANDARDS(5)	See comment 2.	See comment.	See comment.
NPDES Permit #CO 0021202	--	--	--
COMMENTS:	1. Less than a total body burden of 0.0005 mg/g wet wt. in any aquatic organism: total mercury in unfiltered water less than or equal to 0.0002 mg/l at any time; and average total concentration in unfiltered water less than or equal to 0.00005 mg/l. 0.0005 mg/g of fish will protect fish eating birds. 2. Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."

*Not applicable

TABLE 2, Cont'd COLORADO GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Nemagon	Nitrate/Nitrite	1,4-Oxathiane See comment 1.
FEDERAL GUIDELINES (1)			
Recreation and Aesthetic Uses	--	Case-by-case study.	--
Public Water Supplies	--	10 mg/l / 1 mg/l	--
Freshwater, Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS(2)	--	10 mg/l NO_3-N	--
COLORADO STANDARDS(5)	See comment.	See comment.	See comment 2.
NPDES Permit #CO 0021202	--	--	--
COMMENTS:	Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	1. Synonym for 1,4-Thioxane. 2. Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."

*Not applicable

TABLE 2, Cont'd COLORADO GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	pH	Potassium	Sodium See comment.
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	6.5 - 8.3	--	--
Public Water Supplies	5.0 - 9.0	--	No limit recommended due to differences in human sodium tolerance.
Freshwater Aquatic Life and Wildlife	6.5 - 9.0 See comment 1.	--	--
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS(2)	6.0 - 9.0	--	--
COLORADO STANDARDS(5)	See comment 2.	See comment.	--
NPDES Permit #CO 0021202	6.0 - 9.0	--	--
COMMENTS:	1. Maximum level of protection 6.5-8.5, no variation greater than 0.5 pH units. High level of protection 6.0-9.0, no variation greater than 0.5 pH units. Moderate level of protection 6.0-9.0, no variation greater than 1.0 pH units. Low level of protection 5.5-9.5, no variation greater than 1.5 pH units. 2. Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant, or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	Sodium in ionic form.

*Not applicable

TABLE 2, Cont'd COLORADO GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Sulfate	Tetrachlorobenzene	Tetrachloroethylene
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	250 mg/l	--	--
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS(2)	--	--	--
COLORADO STANDARDS(5)	See comment.	See comment.	See comment.
NPDES Permit #CO 0021202	--	--	--
COMMENTS:	Colorado Water Quality Standards state that "All state waters shall be: free from substances...which *are toxic or harmful to human*, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	Colorado Water Quality Standards state that "All state waters shall be: free from substances...which *are toxic or harmful to human*, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	Colorado Water Quality Standards state that "All state waters shall be: free from substances...which *are toxic or harmful to human*, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."

*Not applicable

TABLE 2, Cont'd COLORADO GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Trichloroethylene	Triethyl phosphate
FEDERAL GUIDELINES(1)		
Recreation and Aesthetic Uses	--	--
Public Water Supplies	--	--
Freshwater Aquatic Life and Wildlife	--	--
Marine Aquatic Life and Wildlife	*	*
FEDERAL STANDARDS(2)	--	--
COLORADO STANDARDS(5)	See comment.	See comment.
NPDES Permit #CO 0021202	--	--
COMMENTS:	Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."

*Not applicable

C. MARYLAND

Information is presented (Table 3) for 43 parameters; hardness, nitrate/nitrite, pH, 16 inorganic ions or compounds, and 24 inorganic compounds or classes of organic compounds. The parameters, in alphabetical order are:

Aluminum
Anticholinesterase
Arsenic
Benzaldehyde
1-(2-Butoxyethoxy) ethanol
Cadmium
α-(Chloroacetophenone)
α-(Chloromethyl)-benzyl alcohol
Chromium
Copper
Cyanide
1,2-Cyclohexene oxide
Cyclohexanol
Cyclohexanone
Cyclopentanone
Diethyl amine
Diphenyl sulfoxide
1,4-Dithiane
DNT (Dinitrotoluene)
Fluoride
Hardness, total
Hexachloroethane
Hydrocarbons (normal, C_{12}-C_{22})
Iron
Lead
Mercury
Methylcyclohexane
Methyl isopropyl ketone
Nitroglycerine
Nitrate/Nitrite
1,4-Oxathiane
pH
Phosphate, total
Phosphonic acids
Phosphorous, white
Polychlorinated ethylenes and ethanes
Silver
Sulfate

Tetrahydrofuran
Thiodiglycol
Thiophene
TNT (Trinitrotoluene)
Zinc

The following description of potentially toxic substances and pH requirements of Maryland waters is derived from the Maryland Effluent Limitations.(9).

- Toxic materials - any liquid, gaseous, or solid substances or substances in such concentration which, when applied to, discharged to, or deposited in the waters of the State, may exert a poisonous effect detrimental to man or to the propagation, cultivation or conservation of animals, fish or other aquatic life.

- pH - Normal pH values, applicable to all state waters, must not be less than 6.5 nor greater than 8.5, except where - and to the extent that - pH values outside this range occur naturally.

Concentration values of interest in field surveys are summarized in Section III together with a list of compounds for which recommendations cannot be given.

Should further information be requested, the following departments/ people can be contacted:

- Dept. of Natural Resources
  Mr. Herbert Sachs
  Tawes State Office Building
  Annapolis, MD 21401

  Function: Director, Water Resources.

- William E. Chicca
  see above address
  Telephone: (301) 269-3821

- Mike Zickler
  USEPA
  Washington, D.C. 20460
  Telephone: (215) 597-2726

  Function: Chief Overseer of EPA Region III.

TABLE 3

MARYLAND GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Aluminum	Anticholinesterase	Arsenic
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	--	0.05 mg/l. See comment.
Freshwater Aquatic Life and Wildlife	>0.1 mg/l can be deleterious to fish. See comments 1 and 2.	--	--
Marine Aquatic Life and Wildlife	0.01 x 96 hr LC_{50} See comment 3.	--	--
FEDERAL STANDARDS[2]	--	--	0.05 mg/l
MARYLAND STANDARDS[9]	(10)	(10)	(10)
NPDES Permit #MD 0021245	--	--	--
COMMENTS:	1. Aluminum toxicity is dependent on solubility. Solubility is highly a function of water pH and, to a lesser degree, turbidity and form.[8] 2. "At pH 9 at least 5 mg/l aluminum dissolved, and killed fingerling rainbow trout in 4 hrs. The suspended precipitate of ionized aluminum is toxic. In most natural water, the ionized or potentially ionizable aluminum would be in the form of an ionic or neutral precipitate." 3. Concentrations of aluminum exceeding 1.5 mg/l constitute a hazard to the marine environment and levels less than 0.2 mg/l present minimal risk of deleterious effects.		Criteria for arsenic in the irrigation of crops is 0.10 mg/l.

*Not applicable

TABLE 3, Cont'd MARYLAND GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Benzaldehyde	1-(2-Butoxyethoxy) ethanol	Cadmium
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	--	0.01 mg/l
Freshwater Aquatic Life and Wildlife	--	--	0.0004 mg/l in soft water. See comment. 0.0012 mg/l in hard water. See comment.
Marine Aquatic Life and Wildlife	--	--	0.005 mg/l
FEDERAL STANDARDS[2]	--	--	0.01 mg/l
MARYLAND STANDARDS[9]	(10)	(10)	(10)
NPDES Permit #MD 0021245	--	--	--
COMMENTS:			For cladocerans and salmonid fishes. For other, less sensitive aquatic life, the concentration is an order of magnitude greater.

*Not applicable

TABLE 3, Cont'd MARYLAND GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	α-(Chloroacetophenone)	α-(Chloromethyl)-benzyl alcohol	Chromium
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	--	0.05 mg/l. See comment.
Freshwater Aquatic Life and Wildlife	--	--	0.10 mg/l
Marine Aquatic Life and Wildlife	--	--	0.10 mg/l
FEDERAL STANDARDS(9)	--	--	0.05 mg/l
MARYLAND STANDARDS(9)	(10)	(10)	(10)
NPDES Permit #MD 0021245	--	--	--
COMMENTS:			Water Quality Criteria - Report of the National Technical Advisory Committee to the Secretary of the Interior, April 1, 1968, Wash., D.C., Federal Water Pollution Control Administration.

*Not applicable

TABLE 3, Cont'd MARYLAND GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Copper	Cyanide	1,2-Cyclohexene oxide
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	1.0 mg/l	0.2 mg/l	--
Freshwater Aquatic Life and Wildlife	0.1 x 96 hr LC_{50}	0.005 mg/l	--
Marine Aquatic Life and Wildlife	0.01 x 96 hr LC_{50}	0.005 mg/l	--
FEDERAL STANDARDS[2]	--	--	--
MARYLAND STANDARDS[9]	(10)	(10)	(10)
NPDES Permit #MD 0021245	--	--	--

COMMENTS:

*Not applicable

TABLE 3, Cont'd MARYLAND GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Cyclohexanol	Cyclohexanone	Cyclopentanone
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	--	--
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	--	--	--
FEDERAL STANDARDS[2]	--	--	--
MARYLAND STANDARDS[9]	(10)	(10)	(10)
NPDES Permit #MD 0021245	--	--	--

COMMENTS:

*Not applicable

TABLE 3, Cont'd MARYLAND GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Diethyl amine	Diphenyl sulfoxide	1,4-Dithiane
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	--	--
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	--	--	--
FEDERAL STANDARDS(2)	--	--	--
MARYLAND STANDARDS(9)	(10)	(10)	(10)
NPDES Permit #MD 0021245	--	--	--
COMMENTS:			

*Not applicable

TABLE 3, Cont'd MARYLAND GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	DNT(Dinitrotoluene)	Fluoride	Hardness,total
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	Recommended concentrations dependent on temperature. See comment 1.	Depends on consumer preference.
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	--	0.01 x 96 hr LC_{50}. See comment 2.	--
FEDERAL STANDARDS(2)	--	Recommended concentrations dependent on temperature. See comment 1.	--
MARYLAND STANDARDS(9)	(10)	(10)	--
NPDES Permit #MD 0021245	--	--	--
COMMENTS:		1. Annual Ave. of Max. Daily Air Temp., ^{o}F, (fluoride max, mg/l); 80-91,(1.4); 72-79,(1.6); 65-71,(1.8) 59-54,(2.0); 55-58,(2.2); 50-54,(2.4) 2. It is suggested that concentrations of fluoride equal to or exceeding 1.5 mg/l constitute a hazard in the marine environment, and levels less than 0.5 mg/l present minimal risk of deleterious effects.	

*Not applicable

TABLE 3, Cont'd MARYLAND GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Hexachloroethane	Hydrocarbons (normal, C_{12}-C_{22})	Iron
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	--	0.3 mg/l
Freshwater Aquatic Life and Wildlife	--	--	1.0 mg/l
Marine Aquatic Life and Wildlife	--	--	0.05 mg/l
FEDERAL STANDARDS(2)	--	--	--
MARYLAND STANDARDS(9)	(10)	(10)	(10)
NPDES Permit #MD 0021245	--	--	--

COMMENTS:

*Not applicable

TABLE 3, Cont'd MARYLAND GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Lead	Mercury	Methylcyclohexane
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	0.05 mg/l	0.002 mg/l	--
Freshwater Aquatic Life and Wildlife	0.01 x 96 hr LC_{50} See comment 1.	0.00005 mg/l. See comment.	--
Marine Aquatic Life and Wildlife	0.02 x 96 hr LC_{50}. See comment 2.	0.0001 mg/l. See comment.	--
FEDERAL STANDARDS(2)	--	0.002 mg/l	--
MARYLAND STANDARDS(9)	(10)	(10)	(10)
NPDES Permit #MD 0021245	--	--	--
COMMENTS:	1. ...using the receiving or comparable water as the dilutent and soluble lead measurements (using an 0.45 micron filter), for sensitive resident species. 2. 24-hr average concentration should not be greater than 0.01 x 96 hr LC_{50}. Available data suggest that concentrations of lead equal to or exceeding 0.05 mg/l constitute a hazard in the marine environment, and levels less than 0.01 mg/l present minimal risk or deleterious effects.	Less than a total body burden of 0.0005 mg/g wet wt. in any aquatic organism; total mercury in unfiltered water less than or equal to 0.0002 mg/l at any time; and average total concentration in unfiltered water less than or equal to 0.00005 mg/l. 0.0005 mg/g of fish will protect fish-eating birds.	

*Not applicable.

TABLE 3, Cont'd MARYLAND GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Methyl isopropyl ketone	Nitroglycerine	Nitrate/Nitrite
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	Case-by case study.
Public Water Supplies	--	--	10 mg/l / 1 mg/l
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	--	--	--
FEDERAL STANDARDS(2)	--	--	10 mg/l NO_3-N
MARYLAND STANDARDS(9)	(10)	(10)	(10)
NPDES Permit #MD 0021245	--	--	--

COMMENTS:

*Not applicable

TABLE 3, Cont'd MARYLAND GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	1,4-Oxathiane	pH	Phosphate, total
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	6.5 - 8.3	--
Public Water Supplies	--	5.0 - 9.0	See comment 1.
Freshwater Aquatic Life and Wildlife	--	6.5 - 9.0 See comment.	See comment 2.
Marine Aquatic Life and Wildlife	--	6.5 - 8.5	--
FEDERAL STANDARDS[2]	--	6.0 - 9.0	--
MARYLAND STANDARDS[9]	(10)	6.5 - 8.5	(10)
NPDES Permit #MD 0021245	--	6.0 - 8.5	--
COMMENTS:		Maximum level of protection 6.5-8.5, no variation greater than 0.5 pH units. High level of protection 6.0-9.0, no variation greater than 0.5 pH units. Moderate level of protection 6.0-9.0, no variation greater than 1.0 pH units. Low level of protection 5.5-9.5, no variation greater than 1.5 pH units.	1. Due to the complexity of phosphate concentrations in water, biological productivity, and resulting problems such as odor and filtration difficulties, no recommendation is given. 2. 0.050 mg/l in any stream at point where it enters any lake or reservoir, or 0.025 mg/l within the lake or reservoir. 0.100 mg/l in streams or other flowing waters not discharging into impoundments.

*Not applicable

TABLE 3, Cont'd MARYLAND GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Phosphonic acids	Phosphorus, white	Polychlorinated ethylenes and ethanes
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	--	--
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	--	0.0001 mg/l	--
FEDERAL STANDARDS(2)	--	--	--
MARYLAND STANDARDS(9)	(10)	(10)	(10)
NPDES Permit #MD 0021245	--	--	--
COMMENTS:			For example, tetrachloroethylene and trichloroethylene.

*Not applicable

TABLE 3, Cont'd MARYLAND GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Silver	Sulfate	Tetrahydrofuran
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	0.05 mg/l	250 mg/l	--
Freshwater Aquatic Life and Wildlife	0.01 x 96 hr LC_{50}	--	--
Marine Aquatic Life and Wildlife	0.01 x 96 hr LC_{50}	--	--
FEDERAL STANDARDS(2)	0.05 mg/l	--	--
MARYLAND STANDARDS(9)	(10)	(10)	(10)
NPDES Permit #MD 0021245	--	--	--
COMMENTS:			

*Not applicable

TABLE 3, Cont'd MARYLAND GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Thiodiglycol	Thiophene	TNT(Trinitrotoluene)
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	--	--
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	--	--	--
FEDERAL STANDARDS(2)	--	--	--
MARYLAND STANDARDS(9)	(10)	(10)	(10)
NPDES Permit #MD 0021245	--	--	--

COMMENTS:

*Not applicable

TABLE 3, Cont'd MARYLAND GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Zinc
FEDERAL GUIDELINES(1)	
Recreation and Aesthetic Uses	--
Public Water Supplies	5 mg/l
Freshwater Aquatic Life and Wildlife	0.01 x 96 hr LC_{50}
Marine Aquatic Life and Wildlife	0.01 x 96 hr LC_{50}
FEDERAL STANDARDS(2)	--
MARYLAND STANDARDS(9)	(10)
NPDES Permit #MD 0021245	--
COMMENTS:	

*Not applicable

D. MISSOURI

Information is presented (Table 4) for 12 parameters: hardness, nitrate/nitrite, pH, sulfate, 2 explosives-related organic compounds or isomers, and 6 radionuclides or classes of radioactive materials. The parameters, in alphabetical order, are:

DNT (Dinitrotoluene) (All isomers)
Hardness, total
Nitrate/Nitrite
pH
Radium 226
Radium 228
Sulfate
Thorium (Natural)
Thorium Decay Products
TNT (Trinitrotoluene)
Uranium (Natural)
Uranium Decay Products

The following descriptions of radioactive materials, potentially toxic substances, laws pertaining to them, and pH requirements is derived from the Missouri Water Pollution Control Regulations.(11)

- Radioactive Materials: All streams and lakes shall conform with state and Federal limits for radionuclides established for drinking water.

- Toxic substances - Persistent, bioaccumulative, man-made toxic substances are not allowed in the waters of the state. These substances include, but are not limited to: PCB's, DDT, endrin, aldrin, dieldrin, heptachlor, methoxychlor, mirex, toxaphene, lindane, chlordane and benzidine.

Other potentially toxic substances for which sufficient toxicity data are not available may not be released to waters of the state until safe levels are demonstrated through adequate bioassay studies.

Section 204.051 of the State Water Laws states:

1. It is unlawful for any person:

(1) To cause pollution of any waters of the state or to place, cause, or permit to be placed, any water contaminant in a location where it is reasonably certain to cause pollution of any waters of the state;

(2) To discharge any water contaminants into any waters of the state which reduce the quality of such waters below the water quality standards established by the commission if not subject to effluent regulations adopted pursuant to this act;

(3) To violate any pre-treatment and toxic material control regulations, or to discharge any water contaminants into any waters of the state which exceed effluent regulations or permit provisions as established by the commission or required by any Federal water pollution control act;

(4) To discharge any radiological, chemical, or biological warfare agent or high-level radioactive waste into the waters of the state.

Effluents shall not cause pH to be outside the range of 6.5 to 9.0 in waters of the state.

Concentration values of interest in field surveys are summarized in Section III together with a list of compounds for which recommendations cannot be given.

Should further information be required, the following departments/ people can be contacted:

- Missouri Dept. of Natural Resources,
  Water Quality Program
  Robert H. Hentges
  P.O. Box 1368
  2010 Missouri Blvd.
  Jefferson City, MO 65101
  Telephone: (314) 751-3241

  Function: Chief of Permit Section.

- Dr. Kathleen Camin
  Telephone: (816) 374-5493

  Function: Regional Administrator of EPA. Deals with water quality problems.

TABLE 4

MISSOURI GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	DNT(Dinitrotoluene)(All isomers)	Hardness, total	Nitrate/Nitrite
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	--	Case-by case study.
Public Water Supplies	--	Limit dependent on consumer preference.	10 mg/l / 1 mg/l
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS[2]	--	--	10 mg/l NO_3-N
MISSOURI STANDARDS[11]	(12) See comment.	(12)	(12)
NPDES Permit	*	*	*
COMMENTS:	Potentially toxic substances for which sufficient toxicity data are not available may not be released to waters of the state until safe levels are demonstrated through adequate bioassay studies.		

*Not applicable

TABLE 4, Cont'd MISSOURI GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	pH	Radium 226	Radium 228
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	6.5 - 8.3	--	--
Public Water Supplies	5.0 - 9.0	3 pCi/l See comment 1.	See comment 1.
Freshwater Aquatic Life and Wildlife	6.5 - 9.0. See comment 1.	See comment 2.	See comment 2.
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS(2)	6.0 - 9.0	See comment 3.	See comment 3.
MISSOURI STANDARDS(11)	6.5 - 9.0 See comment 2.	See comment 4.	See comment 4
NPDES Permit	*	*	*
COMMENTS:	1. Maximum level of protection 6.5 - 8.5, no variation greater than 0.5 pH units. High level of protection 6.0-9.0, no variation greater than 0.5 pH units. Moderate level of protection 6.0-9.0, no variation greater than 1.0 pH units. Low level of protection 5.5-9.5, no variation greater than 1.5 pH units. 2. Groundwater: Where natural concentrations for pH are higher than these limits, the concentration may not be increased.	1. Gross alpha contamination is to be limited to 0.5 pCi/l. 2. Aquatic organisms concentrate radioisotopes to various degrees in their tissues. The concentrations in freshwater should be low enough so that the concentration in any aquatic species will not exceed Radiation Protection Guides of the U.S. Federal Radiation Council (1961). This recommendation is based on the assumption that radiation levels which are acceptable as human food will not injure the aquatic organisms including wildlife. 3. 0.4 pCi/ml (sol) in controlled areas. 900 pCi/ml (insol) in controlled areas. 0.03 pCi/ml (sol) in uncontrolled areas. 30 pCi/ml (insol) in uncontrolled areas. 4. All streams and lakes shall conform with state and federal limits for radionuclides established for drinking water supply.	1. Gross beta activity contamination (excluding K-40) is to be limited to 5 pCi/l. Gross beta activity levels are keyed to Strontium 90 and radioisotopes of iodine. 2. Aquatic organisms concentrate radioisotopes to various degrees in their tissues. The concentrations in freshwater should be low enough so that the concentration in any aquatic species will not exceed Radiation Protection Guides of the U.S. Federal Radiation Council (1961). This recommendation is based on the assumption that radiation levels which are acceptable as human food will not injure the aquatic organisms including wildlife. 3. 0.8 pCi/m (sol) in controlled areas. 0.007 pCi/ml (insol) in controlled areas. 0.03 pCi/ml (sol) in uncontrolled areas. 30 pCi/ml (insol) in uncontrolled areas. 4. All streams and lakes shall conform with state and federal limits for radionuclides established for drinking water supply.

*Not applicable.

TABLE 4, Cont'd MISSOURI GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Sulfate	Thorium (Natural)	Thorium Decay Products
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	250 mg/l	See comment 1.	See comment 1.
Freshwater Aquatic Life and Wildlife	--	See comment 2.	See comment 2.
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS(2)	--	See comment 3.	See comment 3.
MISSOURI STANDARDS(11)	(12)	See comment 4.	See comment 4.
NPDES Permit	*	*	*

COMMENTS:

1. Gross alpha contamination is to be limited to 0.5 pCi/l.

2. Aquatic organisms concentrate radioisotopes to various degrees in their tissues. The concentrations in freshwater should be low enough so that the concentration in any aquatic species will not exceed Radiation Protection Guides of the U.S. Federal Radiation Council (1961). This recommendation is based on the assumption that radiation levels which are acceptable as human food will not injure the aquatic organisms including wildlife.

3. 60 pCi/ml (sol) in controlled area.
600 pCi/ml (insol) in controlled area.
2 pCi/ml (sol) in uncontrolled area.
20 pCi/ml (insol) in uncontrolled area.

4. All streams and lakes shall conform with state and federal limits for radionuclides established for drinking water supply.

1. Gross alpha contamination is to be limited to 0.5 pCi/l. Gross beta contamination (excluding K-40) is to be limited to 5 pCi/l. Gross beta activity levels are keyed to Strontium 90 and radioisotopes of iodine.

2. Aquatic organisms concentrate radioisotopes to various degrees in their tissues. The concentrations in freshwater should be low enough so that the concentration in any aquatic species will not exceed Radiation Protection Guides of the U.S. Federal Radiation Council (1961). This recommendation is based on the assumption that radiation levels which are acceptable as human food will not injure the aquatic organisms including wildlife.

3. For water standards for any specific radionuclide, see Code of Federal Regulations, Title 10, Part 20, revised as of 1 January, 1977. Controlled areas are those licensed by the Nuclear Regulatory Commission.

(Comments continue on following page.)

	4. All streams and lakes shall conform with state and federal limits for radionuclides established for drinking water supply.

*Not applicable.

TABLE 4, Cont'd MISSOURI GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	TNT(Trinitrotoluene)	Uranium (Natural)	Uranium Decay Products
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	See comment 1.	See comment 1.
Freshwater Aquatic Life and Wildlife	--	See comment 2.	See comment 2.
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS(2)	--	See comment 3.	See comment 3.
MISSOURI STANDARDS(11)	See comment.	See comment 4.	See comment 4.
NPDES Permit	*	*	*
COMMENTS:	Potentially toxic substances for which sufficient toxicity data are not available may not be released to waters of the state until safe levels are demonstrated through adequate bioassay studies.	1. Gross alpha contamination is to be limited to 0.5 pCi/l. 2. Aquatic organisms concentrate radioisotopes to various degrees in their tissues. The concentrations in freshwater should be low enough so that the concentration in any aquatic species will not exceed Radiation Protection Guides of the U.S. Federal Radiation Council (1961). This recommendation is based on the assumption that radiation levels which are acceptable as human food will not injure the aquatic organisms including wildlife. 3. 1000 pCi/ml (sol) in controlled areas. 1000 pCi/ml (insol) in controlled areas. 30 pCi/ml (sol) in uncontrolled areas. 30 pCi/ml (insol) in uncontrolled areas. 4. All streams and lakes shall conform with state and federal limits for radionuclides established for drinking water supply.	1. Gross alpha contamination is to be limited to 0.5 pCi/l. Gross beta contamination (excluding K-40) is to be limited to 5 pCi/l. Gross beta activity levels are keyed to Strontium 90 and radioisotopes of iodine. 2. Aquatic organisms concentrate radioisotopes to various degrees in their tissues. The concentrations in freshwater should be low enough so that the concentration in any aquatic species will not exceed Radiation Protection Guides of the U.S. Federal Radiation Council (1961). This recommendation is based on the assumption that radiation levels which are acceptable as human food will not injure the aquatic organisms including wildlife. 3. For water standards for any specific radionuclide, see Code of Federal Regulations, Title 10, Part 20, revised as of 1 January 1977. Controlled areas are those licensed by the Nuclear Regulatory Commission. (Comments continue on following page.)

	4. All streams and lakes shall conform with state and federal limits for radionuclides established for drinking water supply.

*Not Applicable

E. PENNSYLVANIA

Information is presented (Table 5) for 27 parameters; hardness, nitrate/nitrite, pH, 21 inorganic ions or compounds, and 3 organic compounds. The parameters, in alphabetical order, are:

Aluminum
Cadmium
Chromium
Copper
Cyanide
Fluoride
Hardness, total
Iron
Lead
Lead styphnate
Mercury
Mercury fulminate
Nitrate/Nitrite
PETN (Pentaerythritol tetranitrate)
pH
Phosphate, ortho
Phosphorous, red
Phosphorous, white
Potassium perchlorate
Sodium styphnate
Strontium nitrate
Strontium oxalate
Strontium peroxide
Sulfate
Tetrazine
Trinitroresorcinol
Zinc

The following description and quality standards for industrial wastes is derived from the Pennsylvania Water Quality Criteria.(13)

"Industrial waste" shall be construed to mean any liquid, gaseous, radioactive, solid or other substance, not sewage, resulting from any manufacturing or industry, or from any establishment, as herein defined, and mine drainage, silt, coal mine solids, rock, debris, dirt and clay from coal mines, coal collieries, breakers or other coal

processing operations. "Industrial waste" shall include all such substances whether or not generally characterized as waste.

Industrial wastes shall meet the following quality standards:

- There shall be no discharge of wastes which are acid.
- Waste shall have a pH of not less than 6.0 and not greater than 9.0, except that wastes discharged to acid streams may have a pH greater than 9.0.
- Wastes shall not contain more than seven milligrams per liter of dissolved iron.
- When surface waters are used in the industrial plant, the quality of the effluent need not exceed the quality of the raw water supply if the source of supply would normally drain to the point of effluent discharge.

Concentration values of interest in field surveys are summarized in Section III, together with a list of compounds for which recommendations cannot be given.

Should further information be required, the following departments/ people can be contacted.

- Department of Environmental Resources
  Mr. Walter A. Lyon
  P.O. Box 2063
  Harrisburg, Pennsylvania 17120

  Function: Director, Bureau of Water Quality Management.

- Ted Clista
  see above address
  Telephone: (717) 787-9637

  Function: In charge of administering water pollution control regulations.

TABLE 5

PENNSYLVANIA GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Aluminum	Cadmium	Chromium
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	0.01 mg/l	0.05 mg/l See comment.
Freshwater Aquatic Life and Wildlife	>0.1 mg/l can be delcterious to fish. See comments 1 and 2.	0.0004 mg/l in soft water. See comment. 0.0012 mg/l in hard water. See comment.	0.10 mg/l
Marine Aquatic Life and Wildlife	0.01 x 96 hr LC_{50} See comment 3.	0.005 mg/l	0.10 mg/l
FEDERAL STANDARDS[2]	--	0.01 mg/l	0.01 mg/l
PENNSYLVANIA STANDARDS[13]	(14)	(14)	(14)
NPDES Permit	*	*	*
COMMENTS:	1. Aluminum toxicity is dependent on solubility. Solubility is highly a function of water pH and, to a lesser degree, turbidity and form.[8] 2. "At pH 9 at least 5 mg/l aluminum dissolved and killed finerling rainbow trout in 4 hrs. The suspended precipitate of ionized aluminum is toxic in most natural water, the ionized or potentially ionizable aluminum would be in the form of an ionic or neutral precipitate. 3. Concentrations of aluminum exceeding 1.5 mg/l constitute a hazard to the marine environment and levels less than 0.2 mg/l present minimal risk of deleterious effects.	For cladocerans and salmonid fishes. For other, less sensitive, aquatic life, the concentration is an order of magnitude greater.	Water Quality Criteria – Report of the National Technical Advisory Committee to the Secretary of the Interior, April 1, 1968, Wash. D.C., Federal Water Pollution Control Administration.

*Not applicable

TABLE 5, Cont'd PENNSYLVANIA GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Copper	Cyanide	Fluoride
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	1.0 mg/l	0.2 mg/l	Recommended concentrations dependent on temperature. See comment 1.
Freshwater Aquatic Life and Wildlife	0.1 x 96 LC_{50}	0.005 mg/l	--
Marine Aquatic Life and Wildlife	0.01 x 96 LC_{50}	0.005 mg/l	0.1 x 96 hr LC_{50} See comment 2.
FEDERAL STANDARDS(2)	--	--	Recommended concentrations dependent on temperature. See comment 1.
PENNSYLVANIA STANDARDS(13)	Standard varies with location, 0.02 mg/l to 0.20 mg/l.	*0.025 mg/l*	1.0 mg/l
NPDES Permit	*	*	*
COMMENTS:			1. Annual Ave. of Max. Daily Air Temp., °F, (fluoride max, mg/l); 80-91, (1.4); 72-79, (1.6); 65-71, (1.8); 59-54, (2.0); 55-58, (2.2); 50-54, (2.4). 2. It is suggested that concentrations of fluoride equal to or exceeding 1.5 mg/l constitute a hazard in the marine environment, and levels less than 0.5 mg/l present minimal risk of deleterious effects.

*Not applicable

TABLE 5, Cont'd PENNSYLVANIA GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Hardness, total	Iron	Lead
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	Dependent on consumer preference.	0.3 mg/l	0.05 mg/l
Freshwater Aquatic Life and Wildlife	--	1.0 mg/l	0.01 x 96 hr LC_{50} See comment 1.
Marine Aquatic Life and Wildlife	--	0.05 mg/l	0.02 x 96 hr LC_{50} See comment 2.
FEDERAL STANDARDS(2)	--	--	0.05 mg/l
PENNSYLVANIA STANDARDS(13)	Varies with location.	1.5 mg/l total. 0.3 mg/l dissolved.	0.05 mg/l
NPDES Permit	*	*	*

COMMENTS:

1. ..using the receiving or comparable water as the dilutent and soluble lead measurements (using an 0.45 micron filter), for sensitive resident species.

2. 24-hr average concentration should not be greater than 0.01 x 96 hr LC_{50}. Available data suggest that concentrations of lead equal to or exceeding 0.05 mg/l constitute a hazard in the marine environment and levels less than 0.01 mg/l present minimal risk or deleterious effects.

*Not applicable

TABLE 5, Cont'd PENNSYLVANIA GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Lead styphnate See comment.	Mercury	Mercury fulminate See comment.
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	0.002 mg/l	--
Freshwater Aquatic Life and Wildlife	--	0.00005 mg/l. See comment.	--
Marine Aquatic Life and Wildlife	--	0.0001 mg/l. See comment.	--
FEDERAL STANDARDS[2]	--	0.002 mg/l	--
PENNSYLVANIA STANDARDS[13]	(14)	(14)	(14)
NPDES Permit	*	*	*
COMMENTS:	See lead.	Less than a total body burden of 0.0005 mg/g wet wt. in any aquatic organism; total mercury in unfiltered water less than or equal to 0.0002 mg/l at any time; and average total concentration in unfiltered water less than or equal to 0.00005 mg/l. 0.0005 mg/g of fish will protect fish eating birds.	

*Not applicable

TABLE 5, Cont'd PENNSYLVANIA GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Nitrate/Nitrite	PETN (Pentaerythritol tetranitrate)	pH
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	Case-by-case study.	--	6.5 - 8.3
Public Water Supplies	10 mg/l / 1 mg/l	--	5.0 - 9.0
Freshwater Aquatic Life and Wildlife	--	--	6.5 - 9.0. See comment.
Marine Aquatic Life and Wildlife	--	--	6.5 - 8.5
FEDERAL STANDARDS[2]	10 mg/l NO_3-N	--	6.0 - 9.0
PENNSYLVANIA STANDARDS[13]	(14)	(14)	Range varies with location. Levels given are 6.0-8.5, 6.5-8.5,7.0-9.0.
NPDES Permit	*	*	*
COMMENTS:			Maximum level of protection 6.5-8.5, no variation greater than 0.5 pH units. High level of protection 6.0-9.0, no variation greater than 0.5 pH units. Moderate level of protection 6.0-9.0, no variation greater than 1.0 pH units. Low level of protection 5.5-9.5, no variation greater than 1.5 pH units.

*Not applicable

TABLE 5, Cont'd PENNSYLVANIA GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Phosphate, ortho	Phosphorous, red	Phosphorous, white
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	See comment.	--	--
Freshwater Aquatic Life and Wildlife	See comment.	--	--
Marine Aquatic Life and Wildlife	--	--	0.0001 mg/l
FEDERAL STANDARDS(2)	--	--	--
PENNSYLVANIA STANDARDS(13)	Amount varies with location: 0.03, 0.10, 0.30, 0.40 mg/l or natural level; whichever is greater.	(14)	(14)
NPDES Permit	*	*	*
COMMENTS:	Due to the complexity of phosphate concentrations in water, biological productivity, and resulting problems such as odor and filtration difficulties, no recommendation is given.		

*Not applicable

TABLE 5, Cont'd PENNSYLVANIA GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Potassium perchlorate	Sodium styphnate	Strontium nitrate
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	--	--
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	--	--	--
FEDERAL STANDARDS[2]	--	--	--
PENNSYLVANIA STANDARDS[13]	(14)	(14)	(14)
NPDES Permit	*	*	*

COMMENTS:

*Not applicable

TABLE 5, Cont'd PENNSYLVANIA GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Strontium oxalate	Strontium peroxide	Sulfate
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	--	250 mg/l
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	--	--	--
FEDERAL STANDARDS(2)	--	--	--
PENNSYLVANIA STANDARDS(13)	(14)	(14)	250 mg/l or natural level, whichever is greater.
NPDES Permit	*	*	*

COMMENTS:

*Not applicable

TABLE 5, Cont'd PENNSYLVANIA GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Tetrazine	Trinitroresorcinol	Zinc
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	--	5 mg/l
Freshwater Aquatic Life and Wildlife	--	--	0.01 x 96 hr LC_{50}
Marine Aquatic Life and Wildlife	--	--	0.01 x 96 hr LC_{50}
FEDERAL STANDARDS(2)	--	--	--
PENNSYLVANIA STANDARDS(13)	(14)	(14)	0.05 mg/l
NPDES Permit	*	*	*

COMMENTS:

*Not applicable

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FEDERAL AND STATE WATER QUALITY STANDARDS/GUIDELINES FOR SELECT--ETC(U)
FEB 79 D R COGLEY, L FERESHETIAN, W FOY DAMD17-77-C-7050

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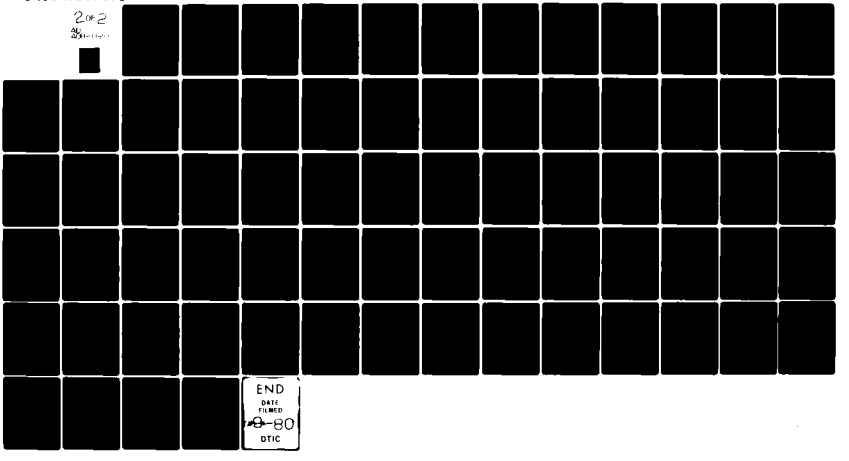

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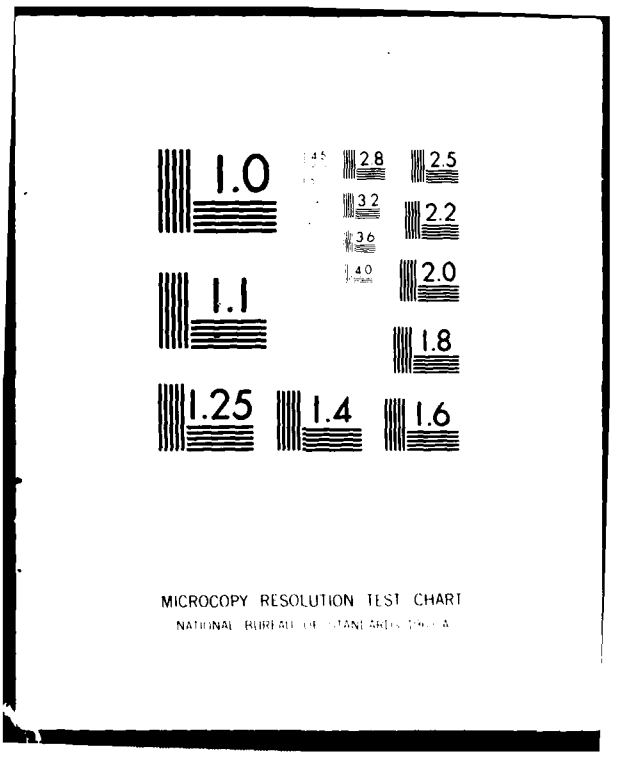
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MICROCOPY RESOLUTION TEST CHART

F. WISCONSIN

Information is presented (Table 6) for 22 parameters; hardness, nitrate/nitrite, pH, 16 inorganic ions or compounds, and 3 organic materials. The parameters, in alphabetical order, are:

Aluminum
Arsenic
Cadmium
Chromium
Copper
Cyanide
DNT (Dinitrotoluene)
Fluoride
Hardness, total
Iron
Lead
Lead ethylhexanoate
Lead salicylate
Mercury
Nitrocellulose
Nitroglycerine
Nitrate/Nitrite
pH
Phosphate, total
Silver
Sulfate
Zinc

The following description of potentially toxic substances and pH requirements is derived from the Wisconsin Water Quality Standards.(15).

- Toxic substances: Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of pubic health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life.

- pH: The pH shall be within the range of 6.0 to 9.0 with no change greater than 0.5 units outside the estimated natural seasonal maximum and minimum.

Concentration values of interest in field surveys are summarized in Section III, together with a list of compounds for which recommendations cannot be made.

Should further information be required, the following departments/ people can be contacted.

- Department of Environmental Resources
  Mr. Thomas A. Kroehn
  P.O. Box 7921
  Madison, Wisconsin 53701

  Function: Adminstrator, Div. of Environmental Standards

- Department of Natural Resources
  Mr. Scheutpelz
  P.O. Box 450
  Madison, Wisconsin 53701

  Function: Water Quality Division. In charge of administering water pollution control regulations.

- George Alexander
  Telephone: (312) 353-2000

  Function: Regional Administrator for EPA Region V. Coordinates all programs.

- Jerome R. McKersie
  see above address

  Function: Chief, Water Quality Evaluation Section.

TABLE 6

WISCONSIN GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Aluminum	Arsenic	Cadmium
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	0.05 mg/l. See comment 1.	0.01 mg/l
Freshwater Aquatic Life and Wildlife	>0.1 mg/l is deleterious to fish. See comments 1 and 2.	--	0.0004 mg/l in soft water. See comment 1. 0.0012 mg/l in hard water. See comment 2.
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS(2)	--	0.05 mg/l	0.01 mg/l
WISCONSIN STANDARDS(15)	See comment 3.	See comment 2.	See comment 2.
NPDES Permit #WI 0002755	--	--	--
COMMENTS:	1. Aluminum toxicity is dependent on solubility. Solubility is highly a function of water pH and, to a lesser degree, turbidity and form.(8) 2. "At pH 9 at least 5 mg/l aluminum dissolved, and killed fingerling rainbow trout in 4 hrs. The suspended precipitate of ionized aluminum is toxic in most natural water, the ionized or potentially ionizable aluminum would be in the form of an ionic or neutral precipitate." 3. Wisconsin Water Quality Standards Chapter NR 102.01(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."	1. Criteria for arsenic in the irrigation of crops is 0.10 mg/l. 2. Wisconsin Water Quality Standards Chapter NR 102.02(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."	1. For cladocerans and salmonid fishes. For other, less sensitive, aquatic life, the concentration is an order of magnitude greater. 2. Wisconsin Water Quality Standards Chapter NR 102.02(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."

*Not applicable.

TABLE 6, Cont'd WISCONSIN GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Chromium	Copper	Cyanide
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	0.05 mg/l See comment 1.	1.0 mg/l	0.2 mg/l
Freshwater Aquatic Life and Wildlife	0.10 mg/l	0.1 x 96 hr LC_{50}	0.005 mg/l
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS(2)	0.05 mg/l	--	--
WISCONSIN STANDARDS(15)	See comment 2.	See comment.	See comment.
NPDES Permit #WI 0002755	--	--	--
COMMENTS:	1. Water Quality Criteria – Report of the National Technical Advisory Committee to the Secretary of the Interior, April 1, 1968, Wash. D.C., Federal Water Pollution Control Administration. 2. Wisconsin Water Quality Standards Chapter NR 102.20(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."	Wisconsin Water Quality Standards Chapter NR 102.20(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."	Wisconsin Water Quality Standards Chapter NR 102.10(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."

*Not applicable

TABLE 6, Cont'd WISCONSIN GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	DNT (Dinitrotoluene)	Fluoride	Hardness, total
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	Recommended concentrations dependent on temperature. See comment 1.	Dependent on consumer preference.
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS[2]	--	The recommended concentrations dependent on temperature. See comment 1.	--
WISCONSIN STANDARDS[15]	See comment.	See comment 2.	--
NPDES Permit #WI 0002755	--	--	--
COMMENTS:	Wisconsin Water Quality Standards Chapter NR 102.02(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."	1. Annual Ave. of Max Daily Air Temp., ^{o}F,(fluoride max, mg/l); 80-91,(1.4); 72-79,(1.6); 65-71,(1.8); 59-54,(2.0); 55-58,(2.2); 50-54,(2.4). 2. Wisconsin Water Quality Standards Chapter NR 102.02(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."	

*Not applicable

TABLE 6, Cont'd WISCONSIN GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Iron	Lead	Lead ethylhexanoate See comment 1.
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	0.3 mg/l	0.05 mg/l	--
Freshwater Aquatic Life and Wildlife	1.0 mg/l	0.01 x 96 hr LC^{50} See comment 1.	--
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS(2)	--	0.05 mg/l	--
WISCONSIN STANDARDS(15)	See comment.	See comment 2.	See comment 2.
NPDES Permit #WI 0002755	--	--	--
COMMENTS:	Wisconsin Water Quality Standards Chapter NR 102.20(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."	1 ..using the receiving of comparable water as the dilutent and soluble lead measurements (using an 0.45 micron filter),for sensitive resident species. 2. Wisconsin Water Quality Standards Chapter NR 102.02(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to aniaml, plant or aquatic life."	1. See lead. 2. Wisconsin Water Quality Standards Chapter NR 102.20(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."

*Not applicable

TABLE 6, Cont'd WISCONSIN GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Lead salicylate See comment 1.	Mercury	Nitrocellulose
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	0.002 mg/l	--
Freshwater Aquatic Life and Wildlife	--	0.00005 mg/l. See comment 1.	--
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS(2)	--	0.002 mg/l	--
WISCONSIN STANDARDS(15)	See comment 2.	See comment.2.	See comment.
NPDES Permit #WI 0002755	--	--	--
COMMENTS:	1. See lead. 2. Wisconsin Water Quality Standards Chapter NR 102.20(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."	1. Less than a total body burden of 0.0005 mg/g wet wt. in any aquatic organism; total mercury in unfiltered water less than or equal to 0.0002 mg/l at any time; and average.total concentration in unfiltered water less than or equal to 0.00005 mg/l. 0.0005 mg/g of fish will protect fish-eating birds. 2. Wisconsin Water Quality Standards Chapter NR 102.20(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant, or aquatic life."	Wisconsin Water Quality Standards Chapter NR 102.02(1)(d) states that "Substances in concentration or combination which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."

*Not applicable

TABLE 6, Cont'd WISCONSIN GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Nitroglycerine	Nitrate/Nitrite	pH
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	Case-by-case study	6.5 - 8.3
Public Water Supplies	--	10 mg/l / 1 mg/l	5.0 - 9.0
Freshwater Aquatic Life and Wildlife	--	--	6.5 - 9.0 See comment.
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS(2)	--	10 mg/l NO_3-N	6.0 - 9.0
WISCONSIN STANDARDS(15)	See comment.	See comment.	6.0 - 9.0. No change greater than 0.5 units.
NPDES Permit #WI 0002755	--	852 kg/day daily average. 1,275 kg/day daily maximum.	--
COMMENTS:	Wisconsin Water Quality Standards Chapter NR 102.20(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."	Wisconsin Water Quality Standards Chapter NR 102.20(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."	Maximum level of protection 6.5-8.5, no variation greater than 0.5 pH units. High level of protection 6.0-9.0, no variation greater than 0.5 pH units. Moderate level of protection 6.0-9.0, no variation greater than 1.0 pH units. Low level of protection 5.5-9.5, no variation greater than 1.5 pH units.

*Not applicable

TABLE 6, Cont'd WISCONSIN GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Phosphate, total	Silver	Sulfate
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	See comment 1.	0.05 mg/l	250 mg/l
Freshwater Aquatic Life and Wildlife	See comment 2.	0.01 x 96 hr LC_{50}	--
Marine Aquatic Life and Wildlife	*	*	--
FEDERAL STANDARDS(2)	--	0.05 mg/l	--
WISCONSIN STANDARDS(5)	See comment 3.	See comment.	See comment.
NPDES Permit #WI 0002755	--	--	8,500 kg/day daily average 12,770 kg/day daily maximum
COMMENTS:	1. Due to the complexity of phosphate concentrations in water, biological productivity, and resulting problems such as odor and filtration difficulties, no recommendation is given. 2. 0.050 mg/l in any stream at point where it enters any lake or reservoir, or 0.025 mg/l within the lake or reservoir. 0.100 mg/l in streams or other flowing waters not discharging into impoundments. 3. Wisconsin Water Quality Standards Chapter NR 102.20(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."	Wisconsin Water Quality Standards Chapter NR 102.20(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."	Wisconsin Water Quality Standards Chapter NR 102.20(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."

*Not applicable

TABLE 6, Cont'd WISCONSIN GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Zinc
FEDERAL GUIDELINES[1]	
Recreation and Aesthetic Uses	--
Public Water Supplies	5 mg/l
Freshwater Aquatic Life and Wildlife	0.01 x 96 hr LC_{50}
Marine Aquatic Life and Wildlife	*
FEDERAL STANDARDS[2]	--
WISCONSIN STANDARDS[15]	See comment.
NPDES Permit #WI 0002755	
COMMENTS:	Wisconsin Water Quality Standards Chapter NR 102.20(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."

*Not applicable

G. COMPREHENSIVE LIST

Information is presented (in Table 7) for 113 parameters(*): BOD, carbonate/bicarbonate, COD, conductivity, hardness, nitrate/nitrite, pH; 42 inorganic ions or compounds; and 64 organic compounds. Concentration values of interest in field surveys are summarized in Section III together with a list of compounds for which recommendations cannot be given.

*Including synonyms.

TABLE 7

COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Aldrin	Aluminum	Antichlolinesterase
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	0.001 mg/l	--	--
Freshwater Aquatic Life and Wildlife	0.000003 mg/l[6]	>0.1 mg/l can be deleterious to fish. See comment 1 and 2.	--
Marine Aquatic Life and Wildlife	*	0.01 x 96 hr LC_{50} See comment 3.	--
FEDERAL STANDARDS[2]	--	--	--
STATE STANDARDS			
Arkansas[3]	*	*	*
Colorado[5]	See comment.	*	*
Maryland[9]	*	(10)	(10)
Missouri[11]	*	*	*
Pennsylvania[13]	*	(14)	*
Wisconsin[15]	*	See comment 4.	*
NPDES PERMITS			
#AR-0001678	*	*	*
#CO-0021202	--	*	*
#MO-0021245	*	--	--
#WI-0002755	*	--	*
COMMENTS:	Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	1. Aluminum toxicity is dependent on solubility. Solubility is highly a function of water pH and, to a lesser degree, turibidy and form.[8] 2. "At pH 9 at least 5 mg/l aluminum dissolved, and killed fingerling rainbow trout in 4 hrs. The suspended precipitate of ionized aluminum is toxic in most natural water, the ionized or potentially ionizable aluminum would be in the form of an ionic orlic neutral precipitate. (Comments continued on following page.)	

	3. Concentrations of aluminum exceeding 1.5 mg/l constitute a hazard to the marine environment and levels less than 0.2 mg/l present minimal risk of deleterious effects. 4. Wisconsin Water Quality Standards Chapter NR 102.20(1)(d) states that "Substances in concentrations or combinations which are harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."

*Not applicable.

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Arsenic	Arsenic, total See comment 1.	Barium
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	0.05 mg/l. See comment 1.	0.05 mg/l.	1 mg/l
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	--	*	*
FEDERAL STANDARDS[2]	0.05 mg/l	0.05 mg/l.	1 mg/l
STATE STANDARDS			
Arkansas[3]	(4)	*	(4)
Colorado[5]	*	See comment 2.	*
Maryland[9]	(10)	*	*
Missouri[11]	*	*	*
Pennsylvania[13]	*	*	*
Wisconsin[15]	See comment 2.	*	*
NPDES PERMITS			
#AR-0001678	--	*	5.0 kg/day
#CO-0021202	*	--	*
#MD-0021245	--	*	*
#WI-0002755	--	*	*
COMMENTS:	1. Criteria for arsenic in the irrigation of crops is 0.10 mg/l. 2 Wisconsin Water Quality Standards Chapter NR 102.02(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."	1. See arsenic. 2. Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)(d)	

*Not applicable

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Benzaldehyde	Benzanthrone	Biochemical Oxygen Demand
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	See comment.	--
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	--	*	*
FEDERAL STANDARDS[2]	--	--	--
STATE STANDARDS			
Arkansas[3]	*	(4)	(4)
Colorado[5]	*	*	*
Maryland[9]	(10)	*	*
Missouri[11]	*	*	*
Pennsylvania[13]	*	*	*
Wisconsin[15]	*	*	*
NPDES PERMITS			
#AR-0001678	*	--	37.5 kg/day
#CO-0021202	*	*	*
#MD-0021245	--	*	*
#WI-0002755	*	*	*
COMMENTS:		USSR reservoir guideline is 0.05 mg/kg, as cited in Loshakov, .,"Hygienic Basis for the Permissible Concentration of Benzanthrone in Reservoir Water, "Vop. Kommunal, gig. 6, 33-36(1966).	

*Not applicable

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	1-(2-Butoxyethoxy) ethanol	Cadmium	Calcium
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	0.01 mg/l	--
Freshwater, Aquatic Life and Wildlife	--	0.0004 mg/l in soft water. See comment 1. 0.0012 mg/l in hard water. See comment 1.	--
Marine Aquatic Life and Wildlife	--	0.005 mg/l	*
FEDERAL STANDARDS(2)	--	0.01 mg/l	--
STATE STANDARDS			
Arkansas(3)	*	(4)	(4)
Colorado(5)	*	See comment 2.	See comment.
Maryland(9)	(10)	(10)	*
Missouri(11)	*	*	*
Pennsylvania(13)	*	(14)	*
Wisconsin(15)	*	See comment 3.	*
NPDES PERMITS			
#AR-0001678	*	--	--
#CO-0021202	*	--	--
#MD-0021245	--	--	*
#WI-0002755	*	--	*
COMMENTS:		1. For cladocerns and salmonid fishes. For other, less sensitive, aquatic life, the concentration is an order of magnitude greater. 2. Colorado Water Quality Standards state that "All state waters shall be free from standards...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	Colorado Water Quality Standards state that "All state waters shall be: free from substances. which are toxic or harmful to human, animal, plant or aquatic life promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."

(Comments continued on following page.)

3. Wisconsin Water Quality Standards Chapter NR 102.20(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be be present in amounts which are acutely harmful to animal, plant or aquatic life."

*Not applicable

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Carbonate/Bicarbonate	Chemical Oxygen Demand	Chloride
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	--	250 mg/l. See comment 1.
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS[2]	--	--	--
STATE STANDARDS			
Arkansas[3]	(4)	(4)	250 mg/l
Colorado[5]	*	*	See comment 2.
Maryland[9]	*	*	*
Missouri[11]	*	*	*
Pennsylvania[13]	*	*	*
Wisconsin[15]	*	*	*
NPDES PERMITS			
#AR-0001678	--	--	--
#CO-0021202	*	*	--
#MD-0021245	*	*	*
#WI-0002755	*	*	*

COMMENTS:

1. Water Quality Criteria - Report of the National Technical Advisory Committee to the Secretary of the Interior, April 1, 1968, Control Wash, DC, Federal Water Pollution Control Administration.

2. Colorado Water Quality Standards state that "All state waters shall be: free from substances..which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."

*Not applicable

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	α-(Chloroacetophenone)	Chloroform	α-(Chloromethyl)-benzyl alcohol
FEDERAL GUIDELINES[1]		See comment 1.	
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	--	--
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	--	*	--
FEDERAL STANDARDS[2]	--	--	--
STATE STANDARDS			
Arkansas[3]	*	*	*
Colorado[5]	*	See comment 2.	*
Maryland[9]	(10)	*	(10)
Missouri[11]	*	*	*
Pennsylvania[13]	*	*	*
Wisconsin[15]	*	*	*
NPDES PERMITS			
#AR-0001678	*	*	*
#CO-0021202	*	--	*
#MD-0021245	--	*	--
#WI-0002755	*	*	*
COMMENTS:		1. Human exposure should be minimized. 2. Colorado Water Quality Standards state that "All state waters shall be: free from substances . . . which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	

*Not applicable

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	p-Chlorophenyl methyl sulfide	p-Chlorophenyl methyl sulfone	Chromium
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	--	0.05 mg/l - See comment 1.
Freshwater Aquatic Life and Wildlife	--	--	0.10 mg/l
Marine Aquatic Life and Wildlife	*	*	0.10 mg/l
FEDERAL STANDARDS(2)	--	--	0.05 mg/l
STATE STANDARDS			
Arkansas(3)	*	*	*
Colorado(5)	See comment.	See comment.	*
Maryland(9)	*	*	(10)
Missouri(11)	*	*	*
Pennsylvania(13)	*	*	(14)
Wisconsin(15)	*	*	See comment 2.
NPDES PERMITS			
#AR-0001678	*	*	*
#CO-0021202	--	--	*
#MD-0021245	*	*	--
#WI-0002755	*	*	--
COMMENTS	Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters Subsection (1)d."	Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	1. Water Quality Criteria - Report of the National Technical Advisory Committee to the Secretary of the Interior, April 1, 1968, Wash, D.C., Federal Water Pollution Control Administration. 2. Wisconsin Water Quality Standards Chapter NR 102.20(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be (Comments continue on following page.)

	present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."

*Not applicable.

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Chromium (hexavalent) See comment 1.	Conductivity	Copper
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	0.05 mg/l. See comment 2	--	1 mg/l
Freshwater Aquatic Life and Wildlife	See comments 2 and 3.	--	0.1 x 96 hr LC_{50}
Marine Aquatic Life and Wildlife	*	*	0.01 x 96 hr LC_{50}
FEDERAL STANDARDS(2)	--	--	--
STATE STANDARDS			
Arkansas(3)	(4)	*	(4)
Colorado(5)	*	--	See comment 1.
Maryland(9)	*	*	(10)
Missouri(11)	*	*	*
Pennsylvania(13)	*	*	(14) Also see comment 2.
Wisconsin(15)	*	*	See comment 3.
NPDES PERMITS			
#AR-0001678	--	*	--
#CO-0021202	*	--	--
#MD-0021245	*	*	--
#WI-0002755	*	*	--

COMMENTS:

1. See chromium.

2. Water Quality Criteria - Report on the National Technical Advisory Committee to the Secretary of the Interior, April 1, 1968, Wash, DC, Federal Water Pollution Control Administration.

3. Concentrations of 0.02 mg/l in soft water have been found safe for salmonid fishes.

1. Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."

2. Amount varies with location. Levels given either: 0.02 mg/l or 0.10 mg/l.

3. Wisconsin Water Quality Standards Chapter NR 102.02(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."

*Not applicable

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Copper, total See comment 1.	Cyanide	1,2-Cyclohexene oxide
FEDERAL GUIDELINES[1]			
Recreation and Aeshetic Uses	--	--	--
Public Water Supplies	1 mg/l	0.2 mg/l	--
Freshwater Aquatic Life and Wildlife	0.1 x 96 hr LC_{50}.	0.005 mg/l	--
Marine Aquatic Life and Wildlife	--	0.005 mg/l	--
FEDERAL STANDARDS[2]	*	--	--
STATE STANDARDS			
Arkansas[3]	*	*	*
Colorado[5]	See comment 2.	*	*
Maryland[9]	*	(10)	(10)
Missouri[11]	*	*	*
Pennsylvania[13]	*	0.025 mg/l	*
Wisconsin[15]	*	See comment.	*
NPDES PERMITS			
#AR-0001678	*	*	*
#CO-0021202	--	*	*
#MD-0021245	*	--	--
#WI-0002755	*	--	*
COMMENTS:	1. See copper. 2. Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)(d)."	Wisconsin Water Quality Standards Chapter Nr 102.02(1)(d) states that "Subtances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."	

*Not applicable

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Cyclohexanol	Cyclohexanone	Cyclopentanone
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	--	--
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	--	--	--
FEDERAL STANDARDS(2)	--	--	--
STATE STANDARDS			
Arkansas(3)	*	*	*
Colorado(5)	*	*	*
Maryland(9)	(10)	(10)	(10)
Missouri(11)	*	*	*
Pennsylvania(13)	*	*	*
Wisconsin(15)	*	*	*
NPDES PERMITS			
#AR-0001678	*	*	*
#CO-0021202	*	*	*
#MO-0021245	--	--	--
#WI-0002755	*	*	*
COMMENTS:			

*Not applicable

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	DCPD(Dicyclopentadiene)	o,p'-DDD	p,p'-DDD
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	0.05 mg/l total for all DDT isomers and metabolites. See comment 1.	0.05 mg/l total for all DDT isomers and metabolites. See comment 1.
Freshwater Aquatic Life and Wildlife	--	0.000002 mg/l total for all DDT isomers and metabolites. See comment 2.	0.000002 mg/l total for all DDT isomers and metabolites. See comment 2.
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS(2)	--	--	--
STATE STANDARDS			
Arkansas(3)	*	(4)	(4)
Colorado(5)	See comment.	*	*
Maryland(9)	*	*	*
Missouri(11)	*	*	*
Pennsylvania(13)	*	*	*
Wisconsin(15)	*	*	*
NPDES PERMITS			
#AR-0001678	*	--	--
#CO-0021202	--	*	*
#MD-0021245	*	*	*
#WI-0002755	*	*	*
COMMENTS:	Colorado Water Quality Standards state that "All state waters be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	1. The persistence, bioaccumulation potential, and carcinogenicity of DDT caution human exposure to a minimum. 2. It is recommended that in a homogeneous sample of 25 or more fish of representative size consumed by birds and mammals, the concentrations of DDT and derivatives (DDD and DDE) be not more than 0.050 mg/kg of wet wgt.	1. The persistence, bioaccumulation potential, and carcinogenicity of DDT caution human exposure to a minimum. 2. It is recommended that in a homogeneous sample of 25 or more fish of representative size consumed by birds and mammals, the concentrations of DDT and derivatives (DDD and DDE) be not more than 0.050 mg/kg of wet wgt.

*Not applicable

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	o,p'-DDE	p,p'-DDE	o,p'-DDT
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	0.05 mg/l total for all DDT isomers and metabolites. See comment 1.	0.05 mg/l total for all DDT isomers and metabolites. See comment 1.	0.05 mg/l total for all DDT isomers and metabolites. See comment 1.
Freshwater Aquatic Life and Wildlife	0.000002 mg/l total for all DDT isomers and metabolites. See comment 2.	0.000002 mg/l total for all DDT isomers and metabolites. See comment 2.	0.000002 mg/l total for all DDT isomers and metabolites. See comment 2.
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS(2)	--	--	--
STATE STANDARDS			
Arkansas(3)	(4)	(4)	(4)
Colorado(5)	*	*	See comment 3.
Maryland(9)	*	*	*
Missouri(11)	*	*	*
Pennsylvania(13)	*	*	*
Wisconsin(15)	*	*	*
NPDES PERMITS			
#AR-0001678	--	--	--
#CO-0021202	*	*	--
#MD-0021245	*	*	*
#WI-0002755	*	*	*

COMMENTS:

1. The persistence, bioaccumulation potential, and carcinogenicity of DDT caution human exposure to a minimum.

2. It is recommended that in a homogeneous sample of 25 or more fish of representative size consumed by birds and mammals, the concentrations of DDT and derivatives (DDD and DDE) be not more than 0.050 mg/kg of wet wgt.

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(Comments continue on following page.)

3. Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."

*Not applicable

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	p,p'-DDT	Dieldrin	Diethyl amine
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	0.05 mg/l total for all DDT isomers and metabolites. See comment 1.	0.001 mg/l	--
Freshwater Aquatic Life and Wildlife	0.000002 mg/l total for all DDT isomers and metabolites. See comment 2.	0.000003 mg/l[6]	--
Marine Aquatic Life and Wildlife	*	*	--
FEDERAL STANDARDS[2]	-	--	--
STATE STANDARDS			
Arkansas[3]	(4)	*	*
Colorado[5]	See comment 3.	See comment.	*
Maryland[9]	*	*	(10)
Missouri[11]	*	*	*
Pennsylvania[13]	*	*	*
Wisconsin[15]	*	*	*
NPDES PERMITS			
#AR-0001678	--	*	*
#CO-0021202	--	--	*
#MD-0021245	*	*	--
#WI-0002755	*	*	*
COMMENTS:	1. The persistence, bioaccumulation potential, and carcinogenicity of DDT caution human exposure to a minimum. 2. It is recommended that in a homogeneous sample of 25 or more fish of representative size consumed by birds and mammals, the concentrations of DDT and derivatives (DDD and DDE) be not more than 0.050 mg/kg of wet wgt. (Comments continue on following page.)	Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	

3. Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."

*Not applicable

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	DIMP(Diisopropyl methylphosphonate)	Dioctyl adipate	Dioctyl azelate
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	--	--
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	*	*	*
FEDERAL STANDARDS[2]	--	--	--
STATE STANDARDS			
Arkansas[3]	*	*	*
Colorado[5]	See comment.	See comment.	See comment.
Maryland[9]	*	*	*
Missouri[11]	*	*	*
Pennsylvania[13]	*	*	*
Wisconsin[15]	*	*	*
NPDES PERMITS			
#AR-0001678	*	*	*
#CO-0021202	--	--	--
#MD-0021245	*	*	*
#WI-0002755	*	*	*
COMMENTS:	Colorado Water Quality Standards state that "All state waters be: free from substances..which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	Colorado Water Quality Standards state that "All state waters be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	Colorado Water Quality Standards state that "All state waters be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."

*Not applicable

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Diphenyl sulfoxide	1,4-Dithiane	DNT (Dinitrotoluene)
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	--	--
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	--	--	--
FEDERAL STANDARDS[2]	--	--	--
STATE STANDARDS			
Arkansas[3]	*	*	*
Colorado[5]	*	*	*
Maryland[9]	(10)	(10)	(10)
Missouri[11]	*	*	(12)
Pennsylvania[13]	*	*	*
Wisconsin[15]	*	*	See comment.
NPDES PERMITS			
#AR-0001678	*	*	*
#CO-0021202	*	*	*
#MD-0021245	--	--	--
#WI-0002755	*	*	--

COMMENTS:

Wisconsin Water Quality Standards Chapter 102.02(1)(d) states that "Substances in concentrations of combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."

*Not applicable

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	DNT (All isomers)	Endrin	Fluoride
FEDERAL GUIDELINES[1]	See comment.		
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	0.002 mg/l	Recomended concentration dependent on temperature. See comment 1.
Freshwater Aquatic Life and Wildlife	--	0.000004 mg/l	--
Marine Aquatic Life and Wildlife	*	*	0.1 x 96 hr LC_{50}. See comment 2.
FEDERAL STANDARDS[2]	--	--	Recommended concentration dependent on temperature See comment 1
STATE STANDARDS			
Arkansas[3]	*	*	*
Colorado[5]	*	See comment.	See comment 3.
Maryland[9]	*	*	(10)
Missouri[11]	(12)	*	*
Pennsylvania[13]	*	*	1.0 mg/l
Wisconsin[15]	*	*	See comment 4.
NPDES PERMITS			
#AR-0001678	*	*	*
#CO-0021202	*	--	--
#MD-0021245	*	*	--
#WI-0002755	*	*	--
COMMENTS	See DNT.	Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)(d)."	1. Annual Ave. of Max. Daily Air Temp., °F, (Fluoride max, mg/l); 80-91,(1-4); 72-79,(1.6); 65-71,(1.8); 59-54,(2.0); 55-58,(2.2); 50-54,(2.4). 2. It is suggested the concentrations of fluoride equal to or exceeding 1.5 mg/l constitute a hazard in the marine environment, and levels less than 0.5 mg/l present minimal risk of deleterious effects

(Comments continued on following page.)

3. Colorado Water Quality Standards state "All state waters shall be free from substances which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."

4. Wisconsin Water Quality Standards Chapter NR 102.02(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."

*Not applicable.

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Green Dye(1,4-di-p-toluidinoanthraquinone)	Hardness, total	Hexachlorobutadiene
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	Dependent on consumer preference.	--
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	*	--	*
FEDERAL STANDARDS[2]	--	--	--
STATE STANDARDS			
Arkansas[3]	(4)	--	*
Colorado[5]	*	--	See comment.
Maryland[9]	*	--	*
Missouri[11]	*	--	*
Pennsylvania[13]	*	Varies with location.	*
Wisconsin[15]	*	--	*
NPDES PERMITS			
#AR-0001678	--	--	*
#CO-0021202	*	--	--
#MD-0021245	*	--	*
#WI-0002755	*	--	*
COMMENTS:			Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."

*Not applicable

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Hexachloroethane	Hexachloronorbornadiene	Hydrocarbons (Normal, C_{12}-C_{22})
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	--	--
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	--	*	--
FEDERAL STANDARDS(2)	--	--	--
STATE STANDARDS			
Arkansas(3)	*	*	*
Colorado(5)	*	See comment.	*
Maryland(9)	(10)	*	(10)
Missouri(11)	*	*	*
Pennsylvania(13)	*	*	*
Wisconsin(15)	*	*	*
NPDES PERMITS			
#AR-0001678	*	*	*
#CO-0021202	*	--	*
#MD-0021245	--	*	--
#WI-0002755	*	*	*
COMMENTS:		Colorado Water Quality Standards state that "All state waers shall be: free from substances..which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	

*Not applicable

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	7-Hydroxybicyclo-(2,2,1)-hepta-2,5-diene	Iron	Isodrin
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	0.3 mg/l	--
Freshwater Aquatic Life and Wildlife	--	1.0 mg/l	--
Marine Aquatic Life and Wildlife	*	0.05 mg/l	*
FEDERAL STANDARDS[2]	--	--	--
STATE STANDARDS			
Arkansas[3]	*	*	*
Colorado[5]	See comment.	*	See comment.
Maryland[9]	*	(10)	*
Missouri[11]	*	*	*
Pennsylvania[13]	*	1.5 mg/l total. 0.3 mg/l dissolved	*
Wisconsin[15]	*	See comment.	*
NPDES PERMITS			
#AR-0001678	*	*	*
#CO-0021202	--	*	--
#MD-0021245	*	--	*
#WI-0002755	*	--	*
COMMENTS:	Colorado Water Quality Standards state that "All state waters shall be: free from substances..which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	Wisconsin Water Quality Standards Chapter NR 102.02(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant, or aquatic life."	Colorado Water Quality Standards state that "All state waters shall be free from substances..which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."

*Not applicable

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Lead	Lead ethylhexanoate See comment 1.	Lead salyicylate See comment 1
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	0.05 mg/l	--	--
Freshwater Aquatic Life and Wildlife	0.01 x 96 hr LC_{50}. See comment 1.	--	--
Marine Aquatic Life and Wildlife	0.02 x 96 hr LC_{50}. See comment 2.	*	*
FEDERAL STANDARDS(2)	0.05 mg/l	--	--
STATE STANDARDS			
Arkansas(3)	(4)	*	*
Colorado(5)	*	*	*
Maryland(9)	(10)	*	*
Missouri(11)	*	*	*
Pennsylvania(13)	0.05 mg/l	*	*
Wisconsin(15)	See comment 3.	See comment 2.	See comment 2.
NPDES PERMITS			
#AR-0001678	0.2 kg/day	*	*
#CO-0021202	*	*	*
#MD-0021245	--	*	*
#WI-0002755	--	--	--
COMMENTS:	1. ..using the receiving or comparable water as the dilutent and soluble lead measurements (using an 0.45 micron filter), for sensitive resident species. 2. 24-hour average concentration should not be greater than 0.01 x 96 hour LC_{50}. Available data suggest that concentrations of lead equal to or exceeding 0.05 mg/l constitute a hazard in the marine environment and levels less than 0.01 mg/l present minimal risk or deleterious effects. (Comments continued on following page.)	1. See lead. 2. Wisconsin Water Quality Standards Chapter NR 102.02(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."	1. See lead. 2. Wisconsin Water Quality Standards Chapter NR 102.02(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."

3. Wisconsin Water Quality Standards Chapter NR 102.02(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."

*Not applicable

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Lead styphnate See comment.	Magnesium	Mercury
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	--	0.002 mg/l
Freshwater Aquatic Life and Wildlife	--	--	0.00005 mg/l. See comment.
Marine Aquatic Life and Wildlife	--	*	0.0001 mg/l. See comment.
FEDERAL STANDARDS(2)	--	--	0.002 mg/l
STATE STANDARDS			
Arkansas(3)	*	(4)	(4)
Colorado(5)	*	*	*
Maryland(9)	*	*	(10)
Missouri(11)	*	*	*
Pennsylvania(13)	(14)	*	(14)
Wisconsin(15)	*	*	(16)
NPDES PERMITS			
#AR-0001678	*	0.2 kg/day	--
#CO-0021202	*	*	--
#MO-0021245	*	*	*
#WI-0002755	*	*	--
COMMENTS:	See lead.		Less than .0005 mg/g (wet wgt total body burden in any aquatic organism): total mercury in un-filtered water less than or equal to .0002 mg/l at any time, and; average total concentration in unfiltered water less than or equal to 0.00005 mg/l. 0.0005 mg/g of fish will protect fish eating birds.

*Not applicable

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Mercury fulminate See comment.	Mercury, total See comment 1.	Methylcyclohexane
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	0.002 mg/l	--
Freshwater Aquatic Life and Wildlife	--	0.00005 mg/l.	--
Marine Aquatic Life and Wildlife	--	*	--
FEDERAL STANDARDS[2]	--	0.002 mg/l.	--
STATE STANDARDS			
Arkansas[3]	*	*	*
Colorado[5]	*	See comment 2.	*
Maryland[9]	*	*	(10)
Missouri[11]	*	*	*
Pennsylvania[13]	(14)	*	*
Wisconsin[15]	*	*	*
NPDES PERMITS			
#AR-0001678	*	*	*
#CO-0021202	*	--	*
#MD-0021245	*	*	--
#WI-0002755	*	*	*
COMMENTS:	See mercury.	1. See mercury. 2. Colorado Water Quality Standards state that "All state waters shall be: free from substances..which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	

*Not applicable

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Methylene chloride	Methyl isopropyl ketone	2-Methyl-2-pentanol
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	--	--
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	*	--	*
FEDERAL STANDARDS[2]	--	--	--
STATE STANDARDS			
Arkansas[3]	*	*	*
Colorado[5]	See comment.	*	See comment.
Maryland[9]	*	(10)	*
Missouri[11]	*	*	*
Pennsylvania[13]	*	*	*
Wisconsin[15]	*	*	*
NPDES PERMITS			
#AR-0001678	*	*	*
#CO-0021202	--	*	--
#MD-0021245	*	--	*
#WI-0002755	*	*	*
COMMENTS:	Colorado Water Quality Standards state that "All state waters shall be: free from substances:..which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."		Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."

*Not applicable

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Nemagon	Nitrate/Nitrite	Nitrocellulose
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	Case-by-case study.	--
Public Water Supplies	--	10 mg/l / 1 mg/l	--
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	*	--	*
FEDERAL STANDARDS(2)	--	10 mg/l NO_3-N	--
STATE STANDARDS			
Arkansas(3)	*	(4)	*
Colorado(5)	See comment.	See comment 1.	*
Maryland(9)	*	(10)	*
Missouri(11)	*	(12)	*
Pennsylvania(13)	*	(14)	*
Wisconsin(15)	*	See comment 2.	See comment.
NPDES PERMITS			
#AR-0001678	*	--	*
#CO-0021202	--	--	*
#MD-0021245	*	--	*
#WI-0002755	*	852 kg/day daily average 1,275 kg/day daily maximum.	--
COMMENTS:	Colorado Water Quality Standards state that "All state waters shall be: free from substances..which are toxic or harmful to human, animal, plant or aquatic ife, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	1. Colorado Water Quality Standards state that "All state waters shall be free from substances which are toxic or harmful to human, animal, plant, or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."	Wisconsin Water Quality Standards Chapter Nr 102.02(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to aniaml, plant or aquatic life."

(Comments continued on following page.)

2. Wisconsin Water Quality Standards Chapter NR 102.02(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."

*Not applicable

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Nitrogen/Kjeldahl	Nitroglycerine	1,4-Oxathiane See comment 1.
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	--	--
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	*	--	--
FEDERAL STANDARDS(2)	--	--	--
STATE STANDARDS			
Arkansas(3)	(4)	*	*
Colorado(5)	*	*	See comment 2.
Maryland(9)	*	(10)	(10)
Missouri(11)	*	*	*
Pennsylvania(13)	*	*	*
Wisconsin(15)	*	See comment.	*
NPDES PERMITS			
#AR-0001678	--	*	*
#CO-0021202	*	*	*
#MD-0021245	*	--	--
#WI-0002755	*	--	*
COMMENTS		Wisconsin Water Quality Standards Chapter NR 102.02(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."	1. Synonym for 1,4-Thioxane. 2. *Colorado Water Quality* Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant, or aquatic life promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."

*Not applicable.

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	PETN (Pentaerythritol tetranitrate)	pH	Phosphate, ortho
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	6.5 - 8.3	--
Public Water Supplies	--	5.0 - 9.0	See comment.
Freshwater Aquatic Life and Wildlife	--	6.5 - 9.0. See comment 1.	See comment.
Marine Aquatic Life and Wildlife	--	6.5 - 8.5	--
FEDERAL STANDARDS(2)	--	6.0 - 9.0	--
STATE STANDARDS			
Arkansas(3)	*	6.0 - 9.0. No fluctuation greater than 1.0 pH unit per 24 hours.	--
Colorado(5)	*	See comment 2.	*
Maryland(9)	*	6.0 - 8.5	--
Missouri(11)	*	6.5-9.0. See comment 3.	*
Pennsylvania(13)	(14)	Range varies with location. Levels given are 6.0-8.5, 6.5-8.5,7.0-9.0	Varies with location: 0.03, 0.10, 0.30, 0.40 mg/l or natural level, whichever is greater.
Wisconsin(15)	*	6.0 - 9.0. No change greater than 0.5 units.	*
NPDES PERMITS			
#AR-0001678	*	--	5.0 kg/day
#CO-0021202	*	6.0 - 9.0	*
#MD-0021245	*	6.0 - 8.5	--
#WI-0002755	*	--	--

COMMENTS:

1. Maximum level of protection 6.5-8.5, no variation greater than 0.5 pH units. High level of protection, 6.0-9.0, no greater than 0.5 pH units. Moderate level of protection, 6.0-9.0, no variation greater than 1.0 pH units. Low level of protection, 5.5-9.5, no variation greater than 1.5 pH units.

Due to the complexity of relationships of phosphate concentration in water, biological productivity, and resulting problems such as odor and filtration difficulties, no recommendation is given.

(Comments continue on following page.)

2. Colorado Water Quality Standards state that "All state waters shall be: free from substances which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."

3. Groundwater: where natural concentrations for pH are higher than these limits, the concentration may not be increased.

*Not applicable

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Phosphate, total	Phosphonic acids	Phosphorous, red
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	See comment 1.	--	--
Freshwater Aquatic Life and Wildlife	See comment 2.	--	--
Marine Aquatic Life and Wildlife	--	--	--
FEDERAL STANDARDS[2]	--	--	--
STATE STANDARDS			
Arkansas[3]	0.100 mg/l in streams. 0.050 mg/l in lakes and reservoirs.	*	*
Colorado[5]	*	*	*
Maryland[9]	(10)	(10)	*
Missouri[11]	*	*	*
Pennsylvania[13]	*	*	(14)
Wisconsin[15]	See comment 3.	*	*
NPDES PERMITS			
#AR-0001678	5.0 kg/day	*	*
#CO-0021202	*	*	*
#MD-0021245	--	--	*
#WI-0002755	--	*	*

COMMENTS:

1. Due to the complexity of relationships of phosphate concentration in water, biological productivity, and resulting problems such as odor and filtration difficulties, no recommendations is given.

2. 0.050 mg/l in any stream at point where it enters any lake or reservoir, or 0.025 mg/l within the lake or reservoir. 0.100 mg/l in streams or other flowing waters not discharging into impoundments.

3. Wisconsin Water Quality Standards Chapter NR 102.20(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."

*Not applicable

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Phosphorous, white	Polychlorinated ethylenes and ethanes See comment.	Potassium
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	--	--
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	0.0001 mg/l	--	*
FEDERAL STANDARDS(2)	--	--	--
STATE STANDARDS			
Arkansas(3)	(4)	*	(4)
Colorado(5)	*	*	See comment.
Maryland(9)	(10)	(10)	*
Missouri(11)	*	*	*
Pennsylvania(13)	(14)	*	*
Wisconsin(15)	*	*	*
NPDES PERMITS			
#AR-0001678	--	*	--
#CO-0021202	*	*	--
#MD-0021245	--	--	*
#WI-0002755	*	*	*
COMMENTS:		For example, tetrachlorethylene and trichloroethylene.	Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."

*Not applicable

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Potassium perchlorate	Radium 226	Radium 228
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	3 pCi/l See comment 1.	See comment 1.
Freshwater Aquatic Life and Wildlife	--	See comment 2.	See comment 2.
Marine Aquatic Life and Wildlife	--	--	*
FEDERAL STANDARDS[2]	--	See comment 3.	See comment 3.
STATE STANDARDS			
Arkansas[3]	*	*	*
Colorado[5]	*	*	*
Maryland[9]	*	*	*
Missouri[11]	*	See comment 4.	See comment 4.
Pennsylvania[13]	(14)	*	*
Wisconsin[15]	*	*	*
NPDES PERMITS			
#AR-0001678	*	*	*
#CO-0021202	*	*	*
#MD-0021245	*	*	*
#WI-0002755	*	*	*
		(Comments on following page.)	(Comments on following page.)

COMMENTS:	1. Gross alpha contamination is to be limited to 0.5 pCi/l. 2. Aquatic organisms concentrate radioisotopes to various degrees in their tissues. The concentration in fresh or sea water should be low enough so that the concentration in any aquatic species will not exceed Radiation Protection Guides of the U.S. Federal Radiation Council (1961). This recommendation is based upon the assumption that radiation levels which are acceptable as human food will not injure the aquatic organisms including wildlife. 3. 0.4 pCi/ml (sol) in controlled areas. 900 pCi/ml (insol) in controlled areas. 0.03 pCi/ml (sol) in uncontrolled areas. 30 pCi/ml (insol) in uncontrolled areas. 4. All streams and lakes shall conform with state and federal limits for radionuclides established for drinking water supply.	1. Gross beta contamination (excluding k-40) is to be limited to 5pCi/l. The gross beta activity levels are keyed to Strontium 90 and radioisotopes of iodine. 2. Aquatic organisms concentrate radioisotopes to various degrees in their tissues. The concentration in fresh or sea water should be low enough so that the concentration in any aquatic species will not exceed Radiation Protection Guides of the U.S. Federal Radiation Council (1961). This recommendation is based upon the assumptions that radiation levels which are acceptable as human food will not injure the aquatic organisms including wildlife. 3. 0.8 pCi/ml (sol) in controlled areas. 0.007 pCi/ml (insol) in controlled areas. 0.03 pCi/ml (sol) in uncontrolled areas. 30 pCi/ml (insol) in uncontrolled areas. 4. All streams and lakes shall conform with state and federal limits for radionuclides established for drinking water supply.

*Not applicable

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Red dye (1-Methylaminoanthraquinone)	Silver	Sodium See comment.
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	0.05 mg/l	No limit recommended due to differences in human sodium tolerance.
Freshwater Aquatic Life and Wildlife	--	0.01 x 96 hr LC_{50}	--
Marine aquatic Life and Wildlife	*	0.01 x 96 hr LC_{50}	*
FEDERAL STANDARDS[2]	--	0.05 mg/l	--
STATE STANDARDS			
Arkansas[3]	(4)	*	--
Colorado[5]	*	*	--
Maryland[9]	*	(10)	*
Missouri[11]	*	*	*
Pennsylvania[13]	*	*	*
Wisconsin[15]	*	See comment.	*
NPDES PERMITS			
#AR-0001678	--	*	--
#CO-0021202	*	*	--
#MD-0021245	*	--	*
#WI-0002755	*	--	*
COMMENTS:		Wisconsin Water Quality Standards Chapter NR 102.02(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."	Sodium in ionic form.

*Not applicable

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Sodium styphnate	Strontium nitrate	Strontium oxalate
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	--	--
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	--	--	--
FEDERAL STANDARDS(2)	--	--	--
STATE STANDARDS			
Arkansas(3)	*	*	*
Colorado(5)	*	*	*
Maryland(9)	*	*	*
Missouri(11)	*	*	*
Pennsylvania(13)	(14)	(14)	(14)
Wisconsin(15)	*	*	*
NPDES PERMITS			
#AR-0001678	*	*	*
#CO-0021202	*	*	*
#MD-0021245	*	*	*
#WI-0002755	*	*	*
COMMENTS:			

*Not applicable

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Strontium peroxide	Sulfate	Tetrachlorobenzene
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	250 mg/l	--
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	--	--	*
FEDERAL STANDARDS(2)	--	--	--
STATE STANDARDS			
Arkansas(3)	*	--	*
Colorado(5)	*	--	See comment.
Maryland(9)	*	(10)	*
Missouri(11)	*	(12)	*
Pennsylvania(13)	(14)	250 mg/l or natural level, whichever is greater.	*
Wisconsin 15)	*	See comment.	*
NPDES PERMITS			
#AR-0001678	*	--	*
#CO-0021207	*	--	--
#MD-0021245	*	--	*
#WI-0002755	*	8,500 kg/day daily average 12,770 kg/day daily maximum.	*
COMMENTS:		Wisconsin Water Quality Standards Chapter NR 102.20(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."	Colorado Water Quality Standards state that "All state water shall be: free from substances..which are toxic or harmful to human, animal, plant, or aquatic life, promulgated pursuant to Section entitled "Basic Standard Applicable to All State Waters, Subsection (1)d."

*Not applicable

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Tetrachloroethylene	Tetrahydrofuran	Tetrazine
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	--	--
Freshwater Aquatic Life and Wildlife	--	--	--
Marine Aquatic Life and Wildlife	*	--	--
FEDERAL STANDARDS[2]	--	--	--
STATE STANDARDS			
Arkansas[3]	*	*	*
Colorado[5]	See comment.	*	*
Maryland[9]	*	(10)	*
Missouri[11]	*	*	*
Pennsylvania[13]	*	*	(14)
Wisconsin[15]	*	*	*
NPDES PERMITS			
#AR-0001678	*	*	*
#CO-0021202	--	*	*
#MD-0021245	*	--	*
#WI-0002755	*	*	*
COMMENTS:	Colorado Water Quality Standards state that "All state water shall be: free from substances..which are toxic or harmful to human, animal, plant, or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."		

*Not applicable

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Thiodiglycol	Thiophene	Thorium (Natural)
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	--	See comment 1.
Freshwater Aquatic Life and Wildlife	--	--	See comment 2.
Marine Aquatic Life and Wildlife	--	--	*
FEDERAL STANDARDS(2)	--	--	See comment 3.
STATE STANDARDS			
Arkansas(3)	*	*	*
Colorado(5)	*	*	*
Maryland(9)	(10)	(10)	*
Missouri(11)	*	*	See comment 4.
Pennsylvania(13)	*	*	*
Wisconsin(15)	*	*	*
NPDES PERMITS			
#AR-0001678	*	*	*
#CO-0021202	*	*	*
#MD-0021245	--	--	*
#WI-0002755	*	*	*

COMMENTS:

1. Gross alpha contamination is to be limited to 0.5 pCi/l.

2. Aquatic organisms concentrate radioisotopes of various degrees in their tissues. The concentration in fresh water should be low enough so that the concentration in any aquatic species will not exceed Radiation Protection Guides of the U. S. Federal Radiation Council (1961). This recommendation is based on the assumption that radiation levels which are acceptable as human food will not injure the aquatic organisms including wildlife.

3. 60 pCi/ml (sol) in controlled areas.
600 pCi/ml (insol) in controlled areas.
2 pCi/ml (sol) in uncontrolled areas.
20 pCi/ml (insol) in uncontrolled areas.

(Comments continue on following page.)

	4. All streams and lakes shall conform with state and Federal limits for radionuclides established for drinking water supply.

*Not applicable

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Thorium Decay Products	TNT (Trinitrotoluene)	Trichloroethylene
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	See comment 1.	--	--
Freshwater Aquatic Life and Wildlife	See comment 2.	--	--
Marine Aquatic Life and Wildlife	*	--	*
FEDERAL STANDARDS[2]	See comment 3.	--	--
STATE STANDARDS			
Arkansas[3]	*	*	*
Colorado[5]	*	*	See comment.
Maryland[9]	*	(10)	*
Missouri[11]	See comment 4.	(12) See comment.	*
Pennsylvania[13]	*	*	*
Wisconsin[15]	*	*	*
NPDES PERMITS			
#AR-0001678	*	*	*
#CO-0021202	*	*	--
#MO-0021245	*	--	*
#WI-0002755	*	*	*

COMMENTS:

1. Gross alpha contamination is to be limited to 0.5 pCi/l. Gross beta contamination (excluding K-40) is to be limited to 5 pCi/l. Gross beta activity levels are keyed to strontium 90 and radioisotopes of iodine.

2. Aquatic organisms concentrate radioisotopes to various degrees in their tissues.

Potentially toxic substances for which sufficient data are not available may not be released to waters of the state until safe levels are demonstrated through adequate bioassay studies.

Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."

(Comments continued on following page.)

The concentration in fresh water should be low enough so that the concentration in any aquatic species will not exceed Radiation Protection Guides of the U.S. Federal Radiation Council (1961). This recommendation is based on the assumption that radiation levels which are acceptable as human food will not injure the aquatic organisms including wildlife.

3. For water standards for any specific radionuclides, see Code of Federal Regulations, Title 10, Part 20, revised as of 1 January 1977. Controlled areas are those licensed by the Nuclear Regulatory Commission.

4. All streams and lakes shall conform with state and Federal limits for radionuclides established for drinking water supply.

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*Not applicable

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Triethyl phosphate	Trinitroresorcinol	Uranium (Natural)
FEDERAL GUIDELINES[1]			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	--	--	See comment 1.
Freshwater Aquatic Life and Wildlife	--	--	See comment 2.
Marine Aquatic Life and Wildlife	*	--	*
FEDERAL STANDARDS[2]	--	--	See comment 3.
STATE STANDARDS			
Arkansas[3]	*	*	*
Colorado[5]	See comment.	*	*
Maryland[9]	*	*	*
Missouri[11]	*	*	See comment 4.
Pennsylvania[13]	*	(14)	*
Wisconsin[15]	*	*	*
NPDES PERMITS			
#AR-0001678	*	*	*
#CO-0021202	--	*	*
#MD-0021245	*	*	*
#WI-0002755	*	*	*

COMMENTS:

Colorado Water Quality Standards state that "All state waters shall be: free from substances...which are toxic or harmful to human, animal, plant or aquatic life, promulgated pursuant to Section entitled "Basic Standards Applicable to All State Waters, Subsection (1)d."

1. Gross alpha contamination is to be limited to 0.5 pCi/l.

2. Aquatic organisms concentrate radioisotopes to various degrees in their tissues. The concentrations in fresh water should be low enough so that the concentration in any aquatic species will not exceed Radiation Protection Guides of the U.S. Federal Radiation Council (1961). This recommendation is based on the assumption that radiation levels which are acceptable as human food will not injure the aquatic organisms including wildlife.

3. 1000 pCi/ml (sol) in controlled areas.
1000 pCi/ml (insol) in controlled areas.
30 pCi/ml (sol) in uncontrolled areas.
30 pCi/ml (insol) in uncontrolled areas.

(Comments continue on following page.)

4. All streams and lakes shall conform with state and Federal limits for radionuclides established for drinking water supply.

*Not applicable

TABLE 7, Cont'd COMPREHENSIVE LIST OF GUIDELINES, STANDARDS, AND EFFLUENT LIMITATIONS

	Uranium Decay Products	Yellow Dye (Dibenzo(b,def)chrysene-7,14-dione)	Zinc
FEDERAL GUIDELINES(1)			
Recreation and Aesthetic Uses	--	--	--
Public Water Supplies	See comment 1.	--	5 mg/l
Freshwater Aquatic Life and Wildlife	See comment 2.	--	0.1 x 96 hr LC_{50}
Marine Aquatic Life and Wildlife	*	*	0.01 x 96 hr L_{50}
FEDERAL STANDARDS(2)	See comment 3.	--	--
STATE STANDARDS			
Arkansas(3)	*	(4)	(4)
Colorado(5)	*	*	*
Maryland(9)	*	*	(10)
Missouri(11)	See comment 4.	*	*
Pennsylvania(13)	*	*	0.05 mg/l
Wisconsin(15)	*	*	See comment.
NPDES PERMITS			
#AR-0001678	*	--	1.2 kg/day
#CO-0021202	*	*	*
#MD-0021245	*	*	--
#WI-0002755	*	*	--

(Comments continued on following page.)

(Comments continued on following page.)

COMMENTS:

1. Gross alpha contamination is to be limited to 0.5 pCi/l. Gross beta contamination (excluding K-40) is to be limited to 5pCi/l. Gross beta activity levels are keyed to Strontium 90 and radioisotopes of iodine.

2. Aquatic organisms concentrate radioisotopes to various degrees in their tissues. The concentrations in fresh water should be low enough so that the concentration in any aquatic species will not exceed Radiation Protection Guides of the U. S. Federal Radiation Council (1961). This recommendation is based on the assumption that radiation levels which are acceptable as human food will not injure the aquatic organisms including wildlife.

3. For water standards for any specific radionuclide, see Code of Federal Regulation, Title 10, Part 20, revised as of 1 January 1977. Controlled areas are those licensed by the Nucelar Regulatory Commission.

4. All streams and lakes shall conform with state and Federal limits for radionuclides established for drinking water supply.

Wisconsin Water Quality Standards Chapter NR 102.02(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life."

*Not applicable

III. TYPICAL CONCENTRATION VALUES OF INTEREST IN FIELD SURVEYS

Data of Table 7 have been analyzed to determine the lowest concentrations for each parameter which have been specified as standards or guidelines by regulatory agencies. The resultant values for 44 parameters are presented in Table 8. The other 69 parameters for which no recommended values may be given are listed in Table 9.

Concentrations listed in Table 8, with few exceptions, range from 1 ppm downward. Values listed for the chlorinated hydrocarbon pesticides and mercury are well below 1 ppb.

TABLE 8

PARAMETERS WITH SPECIFIC NUMERICAL
GUIDELINES AND/OR STANDARDS*

Parameter	Concentration (mg/l)	Comment
Aldrin**	0.000003	Freshwater aquatic life and wildlife
Aluminum	>0.1	Can be deleterious to fish
Arsenic	0.05	Public water supply criterion; Federal drinking water standard
Arsenic, total	0.05	Public water supply criterion; Federal drinking water standard
Barium	1	Public water supply criterion; Federal drinking water standard
Cadmium	0.0004	In soft water; freshwater aquatic life and wildlife
Chloride	250	Public water supply criterion; Federal drinking water standard
Chromium	0.05	Public water supply criterion; Federal drinking water standard
Chromium (hexavalent)	0.05	Chromium value
Copper	1	Public water supplies
Copper, total	1	Public water supplies
Cyanide	0.005	Freshwater aquatic life and wildlife
o,p'-DDD**	0.000002	Total for all DDT isomers and metabolites in fresh water
p,p'-DDD**	0.000002	Total for all DDT isomers and metabolites in fresh water
o,p'-DDE**	0.000002	Total for all DDT isomers and metabolites in fresh water
p,p'-DDE**	0.000002	Total for all DDT isomers and metabolites in fresh water
o,p'-DDT**	0.000002	Total for all DDT isomers and metabolites in fresh water
p,p'-DDT**	0.000002	Total for all DDT isomers and metabolites in fresh water
DDT, etc**	0.000002	Total for all DDT isomers and metabolites in fresh water
Dieldrin**	0.00003	Freshwater aquatic life and wildlife.
Endrin**	0.000004	Freshwater aquatic life and wildlife.
Fluoride	--	Temperature dependent
Iron	0.05	Marine aquatic life and wildlife
Lead	0.05	Public water supply criterion; Federal drinking water standard
Lead ethylhexanoate	0.05	Lead value
Lead salicylate	0.05	Lead value
Lead styphnate	0.05	Lead value
Mercury	0.00005	Freshwater aquatic life and wildlife
Mercury fulminate	0.00005	Mercury value
Mercury, total	0.00005	Freshwater aquatic life and wildlife
Nitrate/Nitrite	10 / 1	Public water supplies
pH	--	Various standards according to use
Phosphate, ortho	0.03	Depends on location; Pennsylvania standard
Phosphate, total	0.025	Within a lake or reservoir
Phosphorous, white	0.0001	Marine aquatic life and wildlife
Radium 226	0.03 pCi/ml	Soluble radium in uncontrolled areas
Radium 228	0.007 pCi/ml	Insoluble radium in controlled areas
Silver	0.05	Public water supply criterion; Federal drinking water standard
Sulfate	250	Public water supplies
Thorium (Natural)	2 pCi/ml	Soluble thorium in uncontrolled areas
Thorium Decay Products	***	
Uranium (Natural)	30 pCi/ml	Soluble uranium in uncontrolled areas
Uranium Decay Products	***	
Zinc	0.05	Pennsylvania standard

* Derived from Table 7.

** Chemical Indicator of Industrial Contamination as listed in Federal Register, Vol. 43, No. 28, pp. 5756-5780,, 9 February 1978.

*** Gross alpha radioactivity, 0.5 pCi/l. Gross beta radioactivity 5 pCi/l. Guidelines given in Water Quality Criteria 1972, EPA-R3-73-033, March 1973.

TABLE 9

PARAMETERS WITHOUT SPECIFIC NUMERICAL GUIDELINES OR STANDARDS*

Parameter	Comment	Parameter	Comment
Anticholinesterase		Isodrin	
Benzaldehyde		Magnesium	
Benzanthrone	USSR reservoir limit 0.05 mg/kg	Methylcyclohexane	
Biochemical Oxygen Demand		Methylene chloride	
1-(2-Butoxyethoxy) ethanol		Methyl isopropyl ketone	
Calcium		2-Methyl-2-pentanol	
Carbonate/Bicarbonate		Nemagon	
Chemical Oxygen Demand		Nitrocellulose	
«-(Chloroacetophenone)		Nitrogen, Kjeldahl	
Chloroform	Human exposure should be minimized.	Nitroglycerine	
«-(Chloromethyl)-benzyl alcohol		1,4-Oxathiane	
p-Chlorophenyl methyl sulfide		PETN (Pentaerythritol tetranitrate)	
p-Chlorophenyl methyl sulfone		Phosphonic acids	
Conductivity		Phosphorous, red	
1,2-Cyclohexene oxide		Polychlorinated ethylenes and ethanes	
Cyclohexanol		Potassium	
Cyclohexanone		Potassium perchlorate	
Cyclopentanone		Red dye (1-methylaminoanthraquinone)	
DCPD (Dicyclopentadiene)		Sodium	
Diethyl amine		Sodium styphnate	
DIMP (Diisopropyl methylphosphonate)		Strontium nitrate	
Dioctyl adipate		Strontium oxalate	
Dioctyl azelate		Strontium peroxide	
Diphenyl sulfoxide		Tetrachlorobenzene	
1,4-Dithiane		Tetrachloroethylene	
DNT (Dinitrotoluene)**		Tetrahydrofuran	
DNT (All isomers)**		Tetrazine	
Green dye (1,4-di-p-toluidinoanthraquinone)		Thiodiglycol	
Hardness, total		Thiophene	
Hexachlorobutadiene**		1,4-Thioxane (Synonym for 1,4-Oxathiane)	
Hexachloroethane**		TNT	
Hexachloronorbornadiene		Trichloroethylene**	
Hydrocarbons (normal, C_{12}-C_{22})		Triethyl phosphate	
7-Hydroxybicyclo-(2,2,1)-hepta-2,5-diene		Trinitroresorcinol	
		Yellow dye (Dibenzo(b,def)chrysene-7,14-dione)	

* Derived from Table 7.

** Chemical Indicator of Industrial Contamination as listed in Federal Register, Vol. 43, No. 28, pp 5756-5780, 9 February 1978.

IV. FOOTNOTES

1. Taken from Water Quality Criteria 1972. A Report of the Committee on Water Quality Criteria, Washington, D.C., 1972, EPA-R3-73-033, March 1973; Quality Criteria for Water, U. S. Environmental Protection Agency, Washington, D.C., July 1976; and Directory of Federal and State Water Pollution Standards, Illinois Institute for Environmental Quality, Oct. 1976.

2. Environment Reporter, EPA National Interim Primary Drinking Water Regulations (40CFR141) The Bureau of National Affairs, Inc., Washington, D.C.

3. Arkansas Regulation Establishing Water Quality Standards for Surface Waters, Regulation No. 2, Regulation Establishing Water Quality Standards for Surface Waters of the State of Arkansas, Dept. of Pollution Control and Ecology, Adopted May 26, 1967, Amended Sept. 29, 1967, May 25, 1973; Effective Sept. 28, 1973; Sept. 26, 1975.

4. Arkansas Water regulations state: "Toxic materials attributable to municipal, industrial, agricultural, or other waste discharges, shall not be present in receiving waters in such quantities as to be toxic to human, animal, plant or aquatic life or to interfere with the normal propagation of aquatic life. For any toxicants, concentrations in the receiving waters after mixing shall not exceed 0.01 of the ninety-six (96) hour Median Tolerance Limit (TL_m), unless they can be shown to be nonpersistent and noncumulative, and to exhibit no synergistic interactions with other waste or stream components. In no case shall concentrations exceed 0.05 of the 96 hur TL_m. (Regulation No. 2, Regulation Establishing Water Quality Standards for Surface Waters of the State of Arkansas, Sec. 5(k)).

5. Colorado Water Quality Control Commission Water Quality Standards, Adopted January 15, 1974, Effective June 19, 1974.

6. "Toxic Pollutant Effluent Standards, Aldrin/Dieldrin, DDT, Endrin and Toxaphene; Final Decision," Federal Register, Vol. 42 (8), p. 2615, Jan 12, 1977.

7. Ibid, pp. 2615-2617.

8. Burrows, W. Dickinson, "Aquatic Aluminum: Chemistry, Toxicology, and Environmental Prevalence," CRC Critical Reviews in Environmental Control, Vol. 7: 167-215, June, 1977.

9. Maryland Effluent Limitations, Regulation 08.05.04.05 - Effluent Limitations; Effective September 1, 1974.

FOOTNOTES (Cont'd)

10. General Criteria for Maryland waters state that, "The Waters of the State shall at all times be free from...High temperature, toxic, corrosive or other deleterious substances...In concentrations or combinations which interfere directly or indirectly with water uses, or which are harmful to human, animal, plant, or aquatic life. (Maryland Water Pollution Control Regulations - General Requirements Regulation No. 08.05.04.02, Sec. A(4). In addition, discharges which are prohibited include: "The discharge of any pollutant in toxic amounts, including substances which accumulate to toxic amounts during the expected life of organisms in the receiving water or which produce deleterious behavioral effects on the organisms; and, "The discharge of any radiological, chemical or biological warfare agent or high level radioactive waste". Controlled discharges include toxic materials which "shall be eliminated or reduced to limits of tolerance, so that discharge will not be deleterious to humans, livestock, fish, or other aquatic life or wildlife", (Maryland Effluent Limitations - Regulations 08.05.04.05 - Effluent Limitations; Effective Sept. 1, 1974, Secs. A(2) and (3) and B(2)d.

11. Missouri Water Pollution Control Regulations (Missouri Code of State Regulations, Title 10, Chapter 7, Water Quality, approved June 19, 1974, Effective June 29, 1974; Amended Effective April 11, 1975).

12. In the Missouri Water Pollution Control Regulations of the Missouri Clean Water Law, Chapter 7-Water Quality, 10CSR20-7.020-Effluent Regulation; regulations for the control of water pollutant discharges are given. These are based on water pollutant source-classes and recognize:

- publicly owned or regulated wastewater treatment facilities, and all other wastewater treatment facilities which receive only domestic waste;
- insecticide, pesticide, herbicide and fungicide facilties; and
- all other facilities.

Toxic substances are specifically discussed only for "insecticide, pesticide, herbicide, and fungicide "facilities in Chapter 7 Section (3)(D) 2.C "Toxic substances-release shall not contain quantities of such toxic materials above the following levels: Average for any 24 hour composite sample-equal to or less than 1/10 of the toxic level; Maximum for any grab sample-equal to or less than 1/2 of the toxic level. "Toxic level" is defined in Section (1)(D) as "The 96 hour LC_{50} which is a concentration at which 1/2 of the test organisms died in 96 hours."

FOOTNOTES (Cont'd)

Under the Missouri Clean Water Law, Missouri State Statutes, Chapter 204, paragraph 204.41, authority is given to "adopt and promulgate...toxic material control regulations". According to the Missouri Clean Water Commission document entitled Water Quality Standards (1973), Chapter V Water Quality Criteria- Specific Criteria, Sec. 1. Water Quality: "The following water quality criteria shall apply to all classified streams and lakes except as noted...": "Streams and lakes shall be free from substances attributable to municipal, industrial or other discharges or agricultural practices in concentrations or combinations which are toxic or detrimental to human, animal, plant or aquatic life" (Sec.1,d.);

(One may conclude that in the case of serious toxic pollutant discharge problems, the NPDES permit procedure would be invoked and that aquatic bioassay data would be used to establish effluent limitations. Since specific regulations have not been issued, such an enforcement action would be a unique action subject to varied legal interpretations.)

13. Pennsylvania Water Criteria, Pennsylvania Code, Title 25, Part I, Environmental Resources, Chapter 93, Water Quality Criteria; Adopted Sept. 2, 1971; Amended through Feb. 16, 1974; Amended March 1, 1974; Effective March 16, 1974; Amended June 20, 1974; Effective July 24, 1974; Amended Sept. 16, 1976; Effective Oct. 11, 1976.

14. Article IV, Section 401 of the Pennsylvania Clean Streams Law declares it unlawful to discharge into any waters of the Commonwealth" any substance of any kind or character resulting in pollution as herein defined." The definition of pollution as stated in Article I, Section 1 of the Clean Streams Law is "...contamination of any Waters of the Commonwealth such as will create or is likely to create a nuisance or to render such waters harmful, detrimental or injurious to public health, safety or welfare, or to domestic, municipal, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses, or to livestock, wild animals, birds, fish or other aquatic life, including but not limited to such contamination by alteration of the physical, chemical or biological properties of such waters, or change in temperature, taste, color or odor thereof, or the discharge or any liquid gaseous, radioactive, solid or other substances into such waters. The board shall determine when a discharge constitutes pollution, as herein defined, and shall establish standards whereby and wherefrom it can be ascertained and determined whether any such discharge does or does not constitute pollution as herein defined. (The Clean Streams Law approved June 22, 1937, Act 394, P.L. 1987 Amended May 8, 1945, Act 177, P.L. 435; April 20, 1956, Act 489, P.L. 1479, Aug. 23, 1965,, Act 194, P.L. 372; July 31, 1970, Act 222, P.L. 653; Oct. 7, 1976, Act 222, P.L.____.)

FOOTNOTES (Cont'd)

15. Wisconsin Water Quality Standards, Wisconsin Administrative Code, Chapters NR102, NR103, & NR103; Effective Oct. 1, 1973; Amended Aug. 1, 1975.

16. Wisconsin Water Quality Standards Chapter NR 102.20(1)(d) states that "Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amount which are acutely harmful to animal, plant or aquatic life.

V. REFERENCES

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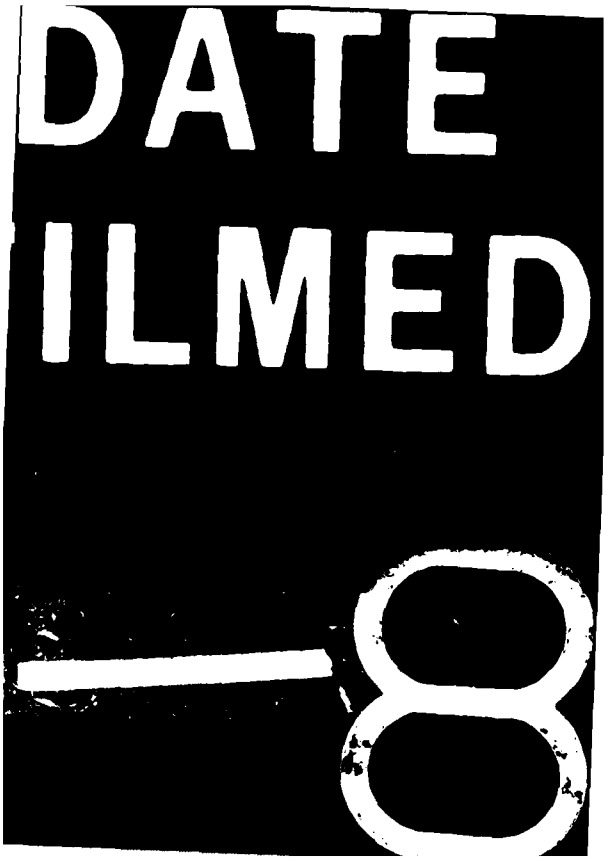
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